Vol. XVI. — No. 6. June 1934.

BULLETIN
OF THE
INTERNATIONAL RAILWAY CONGRESS
ASSOCIATION
(ENGLISH EDITION)

[686]

Competition by roads, waterways and airways.

This issue of the *Bulletin* contains the first of a series of monthly articles devoted to the important question of the competition the railway suffers from other methods of transport, such as from road, water, or air services.

The Executive Committee of our Association thinks it will be of value to keep, at frequent intervals, the member Administrations and readers informed as to the developments of the situation in the various countries.

The information, supplied through the medium of the *Bulletin* to the affiliated Railways and States, and obtained through the appeal we made for our members' collaboration, an appeal which we wish to renew here, cannot fail to make those who read it draw valuable comparisons and facilitate the investigation of measures to improve the efficiency of transport in general.

The evolution of railway traffic, the influence exercised by the competition from other methods of transport, the steps taken by the railways to remedy the drawbacks resulting from such competition, and the legal or fiscal reforms which have already been made or are under consideration, are all points upon which, in our opinion, our information should be as complete as possible.

Below we give some of the information we have already collected.

Netherlands Railways.

The following measures have recently been taken by the Netherlands Railways to combat competition from other methods of transport.

As regards passenger traffic :

1. Increase of the number of services to which local rates apply;

2. reduction of rates (from the 1st April 1933);

3. appointment in most districts of special canvassers to look for traffic.

As regards goods traffic :

Rating measures were put into force as from the 1st May 1933, the most important of which were :

1. reduction of rates;

2. speeding up fast goods services;

3. free delivery, at the consignee's door, of parcels traffic.

The communication received from by the Netherlands Railways, from which the above information was taken, also states that an increase in traffic has been noted since these measures were enforced.

Jugoslav State Railways.

In Jugoslavia, a new general law affecting private transport undertakings came into force on the 9th March, 1932; it takes the economic interests of the railway largely into account. Road transport undertakings are submitted to well-defined regulations, and these require them, as far as postal and passenger services are concerned, to meet the same obligations as those imposed on the railway. Motor transport undertakings, in addition to the ordinary taxes, also have to pay a special contribution towards the maintenance of the roads, a tax which may be as much as 25 % of the cost of transport. This tax is paid into the fund for the construction and maintenance of the roads. On the other hand, the motor transport undertakings are obliged to insure the passengers and the goods traffic with a Jugoslav company. The granting of the concession implies the approval of the carriage rates. The law does not allow free local areas, and requires all professional carriers, whether of goods or passengers, using motor vehicles within a given district or from one district to another, to obtain a concession. This not only affects transport over fixed routes, but also temporary traffic in a given direction. The financial position of the firm applying for a concession is very carefully investigated; it has to guarantee the maintainance of a regular service, and has to comply with all the regulations on the construction and cleanliness of the vehicles, the management, the men employed on the vehicles, and the annual revision of the rates and timetables. The public authorities only authorise the setting up of a new service if this will not affect the firms already operating. The law admits this limitation in order to restrict competition in the traffic as a whole, when the public interest justifies such a restriction. This system has not been long enough in force for judgment to be passed upon it.

In addition to this law on road transport concessions, the fiscal legislation has been modified by a decree which obliges motor transport undertakings to pay the same transport tax as the railway. This measure is considered as likely to diminish the effects of competition.

On the other hand, the Royal Jugoslav Railways, from the 1st November, 1932, have applied rates to meet competition on certain sections of line where their passenger traffic was particularly threatened.

An increase in international traffic carried by motor lorry has been observed. But the regularity of working of the undertakings concerned appearing doubtful, from the legal point of view, the fight has been undertaken in this direction, and for the time being rating measures have been given up.

In addition, new regulations in the field of industrial legislation are under consideration, as the present laws have proved to be insufficient.

It has not yet been found possible to organise joint working between railway and road motor transport services.

Road motor competition in Poland.

The information given below is taken from the *Annual Report for 1933 on the competition and collaboration between the railway and the motor services in the case of passenger and goods traffic*, sent

by the Ministry of Communications of the Polish Republic.

1. *Statistics and sphere of action of motor vehicles.*

According to the most recent statistics available, those dated the 1st July, 1933, it appears that the number of motor vehicles, which had decreased since 1930, has slightly increased in comparison with 1932 (by 2 %). The number of motor omnibuses and lorries has again slightly fallen; the increase is accounted for by taxis and privately-owned cars.

The cause of this slight increase is to be looked for in the modification made in the spring of 1933 to the law of 1931 on the Road Fund, which modification has appreciably reduced the amount of the taxes.

An increase in the number of motor omnibuses was not to be expected, as, according to the temporary provisions of the new law relating to concessions, only omnibuses bought and put into service before the 18th April, 1932, could continue to run, and new omnibuses could only be put into service as new concessions were granted. Nevertheless, as in other years, an increase in the capacity of the omnibuses has been observed. At the present time, this is on the average 20 seats. According to the new law the maximum is 30 seats (Diesel-engined vehicles).

The agricultural and industrial depression has also made it impossible for the lorry transport services to develop. Many works, breweries, and other commercial firms have even gone back to their old horse-drawn vehicles, as the cost is cheaper, the lorries being laid up in their garages. In this way the lorry has lost its best field of action, that in which it can be most useful to the general financial position of transport, that supplementary to the railway. In addition, the extremely low cost of horse-drawn vehicles has led commercial transport undertakings by motor lorries to extend their activities beyond the reasonable limits for such transport, and to look for traffic between widely separated towns, as much as 150 to 200 km. (93 to 124 miles) apart. This concerns in particular transport of woven fabrics, fruit, sugar products, colonial wares, fashion goods, leather, etc. From this point of view the situation has grown steadily worse since 1932.

It is hoped that at least a partial remedy has been found with the putting into force of the regulations relating to the concession system. The lorry transport undertakings now find their activities limited by a very detailed regulation of their rates and other working conditions. No concessions are granted in certain districts or else the distance of the transport must not exceed 150 km. (93 miles); in this case the undertaking is not subjected to any regulations on rates or timetables. If on the contrary definite services are in question over distances exceeding 150 km., the rates are fixed in agreement with the railway, as well as a minimum service, the obligation to carry, and the use of more detailed waybills which enable the consignee to take delivery without first of all making an agreement with the consignor, which is nearly always necessary in the case of motor transport services.

On the whole, it cannot be said that the spirit of competition has increased during 1933. On the contrary, there appears to be a tendency among the bus operators to enter into collaboration with the railway. This latter, which now comes under the same Ministry as the road administration, seems to have given up its grievance against motor competition. By means of concessions and a reasoned and concerted

policy, an endeavour is being made to avoid cases of competition in order to achieve collaboration.

The general tendencies show themselves in an extension of the use of motor vehicles, which at the present time are so little employed, and which can only be sucessful if helped on by the railway. It will be seen how poor Poland is in motor vehicles if their number is compared with the number of inhabitants. There is only one motor vehicle for every 924 people.

2. *Measures taken by the Railway Administration.*

a) *Omnibus traffic.*

During the year 1933, it did not seem as though the omnibus had prejudiced the railway in any new way. It has been estimated that one third of the omnibus services are in direct competition. These are especially services which are shorter by road than by rail, or where the railway services are inadequate.

Among the steps taken by the railway, attention must be called to the extended application of the suburban rates, which give a reduction of 1/4th on the usual rates. They are intended to favour the development of the suburbs, and as competitive rates over certain routes.

Here attention must also be called to the growing importance the railway is attaching to the railcar both on standard and narrow gauge lines, the heavy as well as the light types finding their application. The railcar is especially suitable for hilly lines, and on local sections where it enables faster and more frequent services to be organised, which will give better connections with the general timetable.

A constant improvement is obtained by the acceleration of long-distance trains and suburban trains, the putting into service of seasonal trains, trains to watering places and special trains. The increase in the number of week-end trains with return tickets at reduced prices, such as excursion trains, holiday trains, trains for sporting meetings, etc., is remarkable.

b) *Goods traffic.*

In connection with this traffic, the following may be pointed out :

1. A better utilisation of train services for accelerated traffic; development of light goods trains.

2. The introduction, from the 1st April 1933, of a new system of rates for parcels, with three classes instead of one. A very appreciable reduction in the fast goods train rates (30 to 40 %), so that now it is only 25 % dearer than the ordinary rate.

3. The express goods rates have also been lowered by 40 to 60 %, so that there is very little difference between these rates and those of the fastest goods train traffic.

4. The luggage rates have been reduced and made 10 % below those for express goods.

5. The introduction of bearer waybills enabling a consignee not designated by name to take delivery on production of a duplicate, which is much appreciated by business firms.

6. Rating measures taken in 1933, with the object of attaching customers to the railway, grant refunds which can be as much as 25 % when the quarterly consignments reach a certain tonnage.

3. *Steps taken by the traffic control services.*

The Ministry of Communications, which at the present time includes services for controlling both railway and road motor transport, has drawn up regulations which will have a great influence on the unified transport policy. The following may be mentioned :

a) Elaboration of the prescriptions for

the application of the law on concessions and the establishment of the principles upon which the concession policy is based. The following principles have been admitted :

1. Stimulation of private initiative and amalgamation of small undertakings;

2. Building up of a larger fund for the construction and maintenance of the roads, by means of the grant of concessions with monopoly rights, which carry with them the obligation to contribute towards the cost of maintaining the roads;

3. An appeal to the railway to collaborate with the motor transport undertakings, as in the organisation of such transport.

b) Revision of the law relating to the public road fund. The general tax on the weight of vehicles has been reduced. The taxes on omnibus tickets have been abolished and replaced by a tax on the number of seats and the length of the lines. (This latter tax makes control easier and does not favour the creation of new omnibus services over too long routes). The tax on the tonne-kilometre has also been abolished in the case of goods transported by motor lorry.

c) It is proposed to revise the municipal tax (which is still levied in 65 towns in Poland) on goods brought into the town by railway. The final stage which is aimed at is complete abolition of this tax.

4. Efforts made toward organisation.

An inclination towards joint working is observed in the circles concerned, the road carriers and the consignors. The railway is not opposed to this, as it can expect to make agreements more easily in this case than when it has to deal with separated undertakings with opposing interests.

It must be pointed out in particular that the central omnibus union has absorbed motor lorry transport undertakings.

The Central Commission set up at the Ministry of Communications in conformity with the concession laws, as well as the local commissions, are charged to reconcile the interests in conflict (road maintenance services, railway administrations, post office, chamber of commerce, motor transport undertakings).

At the present time there is in Poland a Communication Council, formerly the Railway Council, which has to consider all general transport problems.

The consignors are collaborating so as to come to agreements with the railway in order that the cartage services and the transport of parcels may be improved, as well as for dealing with questions of grouping and the transport of valuable and perishable goods, and for studying the possible utilisation of motor vehicles for door to door transport.

Finally, it must be mentioned that the professional unions of railwaymen attach great interest to making close relations with the motor services. The « Railway and Road » question was the main item on the programme at the annual meetings of the railway engineers and lawyers. The point of view adopted stresses the development of traffic by motor vehicles, insists upon its being linked up with the main line railways and calls for a more commercial working of the railways.

[385. 1 & 656]

INTERNATIONAL RAILWAY CONGRESS ASSOCIATION.

INQUIRY INTO QUESTIONS OF IMMEDIATE INTEREST.

(Decision taken by the Permanent Commission at its Meeting held on July 29th, 1933.)

QUESTION II.

« The World Crisis and Railways

and the effects of the crisis on railway working; measures taken to lessen the effect of the crisis; competition or collaboration between railway and road transport; a forecast of the future; new ideas as to passenger transport, such as light quick trains between large towns and between large and small towns, running at regular intervals .»

REPORT

(Main-line railways of all countries except those affiliated to the Internatoinal Railway Union)

by Mr. ASHTON DAVIES, O.B.E.,
Chief Commercial Manager, London, Midland & Scottish Railway.

I. — Introduction.

Before I begin my report on the above question, I would point out that it is still too soon to present a full report on the world crisis and the effects of that crisis on railways. The world is still in crisis and the effects are not yet fully visible. It is true there is some amelioration of the general economic situation, but when a patient has been in a high fever for so long, one cannot see the full effects of the illness on his constitution the day after his temperature begins to fall. My report, therefore, is necessarily confined to the effects of the world crisis on railways so far.

I have been asked to report on over sixty different railways who are members of the International Railway Congress Association, but not of the International Railway Union, and whose sphere of operation embraces eighteen different countries. The following are the countries, and the railways operating in each which come within my remit.

United States of America	12	railways.
Canada	2	»
Argentine	8	»
Brazil	3	»
Uruguay	2	»
Ireland	2	»
British Africa	5	»
Egypt	1	railway.
Ceylon	1	»
Federated Malay States	1	»
India	11	railways.
New Zealand	1	railway.
Belgian Colony	4	railways.
Chili	2	»
Dutch Colonies	2	»
French Colonies	2	»
Iraq	1	railway.
Portuguese Colonies	3	railways.

In view of the wide field of investigation my task has not been easy, and the difficulty in obtaining information has been increased by the fact that most of the railways have been unable to send it in time to be incorporated in my report.

While, therefore, I have taken every care to ensure the accuracy of the information, many facts and figures have had to be obtained from sources other than first-hand. Acknowledgment is especially due to the assistance I have received from the Railway Research Service Bureau in London.

Having regard to the number of different countries concerned, I propose first to give an account, country by country of the position, and second to draw such general conclusions as may be warranted by the situation.

In making comments on individual railways I have omitted to mention certain systems altogether, owing to inability to obtain information, and in the case of certain other railways, I have limited myself to brief comments which have a bearing on the remit.

I have treated the railways of the United States in closer detail than other systems for the following reasons : — the territory served by these railways is very large and includes wide areas of agricultural country as well as big industrial centres. The railway system has, therefore, to meet a demand for rail transport of a very varied character, including high-speed express trains between cities a thousand miles apart; frequent and fast services between towns separated by barely a tenth of that distance; service for vast agricultural areas with widely-scattered populations; and intensive services in densely-populated districts near the centres of industry.

It is doubtful if any other country presents such a variety of rail transport, or so many examples of different operating methods.

II. — Reports.

The reports on the various railways follow in order thus :

Number of page	COUNTRY.	Name of Railway.
527-541	1. The United States of America	
541-542	2. Canada.	Canadian National. Canadian Pacific.
542-546	3. Argentine	Buenos Aires Great Southern. Buenos Aires Pacific. Buenos-Aires Western. Central Argentine. Entre Rios.
546-547	4. Brazil	Great Western of Brazil.
547	5. Uruguay	Central Uruguay Ry. of Montevideo.
548-549	6. Ireland	Great Northern. Great Southern.
550-552	7. British Africa	South African Railways & Harbours. Kenya & Uganda. Nigerian.
552	8. Egypt	Egyptian State.
552-553	9. Ceylon	Ceylon Government.
553-554	10. Federated Malay States. .	F. M. S. Railways.
554-555	11. India	
555-556	12. New Zealand	New Zealand Government.

The United States of America.

SUMMARY.

1. *Effect of the crisis on the railways.*
   a) General.
   b) Road competition.
   c) Air competition.
2. *Legislative assistance received by the railways.*
   a) General legislation.
   b) Legislation specially directed toward road competition.
3. *Measures taken by the railways to meet the situation.*
   a) Co-ordination between road and rail.
   b) Reduction in passenger fares.
   c) Light units for passenger services.
   d) Acceleration of trains.
   e) Introduction of smaller wagons.
   f) Alterations in methods of working to effect economies and to improve service.
4. *The outlook for the future.*

1. — The effect of the crisis on the railways.

a) *General.*

The crisis which began in 1929 was so widespread in its effect that it is not necessary to shew in detail how each Company was affected individually. A review of the Class 1 railways (that is to say the lines forming over 95 % of the total United States mileage) since 1929 will indicate the difficulties which have faced the whole railway industry over the past four years.

The United States railways reached their zenith in 1929, which was the « peak » year of the post-war period. The crisis which followed had an immediate effect on their fortunes, and this, combined with the road competition which had been increasing for the past six or seven years, and the more recent air competition, produced a situation which soon became critical. The gross revenue of the railways (Class 1) fell from $ 6 279 millions in 1929 to $ 3 127 millions in 1932, a decline of 50 % in three years. Freight traffic receipts declined by 49 % and passenger receipts by 56 %.

As regards passenger receipts, whereas the total number of passengers carried was 38 % lower in 1932 than in 1929, the figures for medium and long-distance traffic (that is excluding suburban and season ticket traffic) fell by 49 % as compared with 1929. In other words the short-distance traffic by rail maintained itself better than the longer-distance traffic. This was due partly to the fact that season ticket rates have always been very low and partly to the congested state of the roads in the more populated districts.

The fall in freights was due principally to the depression in trade, which caused not only a decline in tonnage but a reduction in stocks. In times of crisis retailers tend to order as little as possible and this helps the road haulier. To such an extent have the railways suffered from diversion to the road of freight passing in small quantities that serious consideration is being given to introducing a small-capacity wagon of, say, 12 tons, which compares with the average freight car capacity in 1932, of 47 tons. Further reference to this problem will be made later in this report, but it may be mentioned at this point that the less-than-carload originating traffic fell from 36 million tons in 1929, to 15 million tons in 1932, which gives an indication of the extent to which the smaller traffics have declined, and while it is not suggested that the whole of this decrease is due to road competition, it can be safely assumed that a large proportion is attributable to diversion to road.

In brief the situation in which the railways find themselves may be attributed to the following factors :

1. World depression in trade.
2. Road competition.

3. Air competition.

4. Hydro-electric and similar power developments tending to restrict the user and haulage of coal.

5. The expansion of the pipe-line industry resulting in the greater use of pipe-lines for the transport of petrol and oil.

6. The increased user of inland waterways.

The following figures, which are in respect of the Class 1 railways give an indication of the severe decline in traffics and revenue since 1929. Figures for 1933 have been inserted where available.

CLASS I RAILROADS.

Year.	Gross receipts.	Working expenses.	Net receipts.
	Dollars.	*Dollars.*	*Dollars.*
1929	6 279 millions.	4 506 millions.	1 773 millions.
1930	5 281 —	3 931 —	1 350 —
1931	4 188 —	3 223 —	965 —
1932	3 127 —	2 403 —	724 —
1933	3 101 —	2 253 —	848 —

Year.	Gross freight receipts.	Gross passenger receipts.
	Dollars.	*Dollars.*
1929	4 825 millions.	873 millions.
1930	4 083 —	729 —
1931	3 254 —	551 —
1932	2 451 —	377 —
1933	2 493 —	331 —

Year.	Less-than-carload originating tonnage.	Average ton-miles daily per freight car in service.
1929	36 millions.	547 ton-miles.
1930	29 —	469 —
1931	22 —	383 —
1932	15 —	300 —

Year.	Passengers carried (total).	Passengers carried (excluding sub-urban and season tickets).
1929	780 millions.	323 millions.
1930	703 —	265 —
1931	596 —	210 —
1932	479 —	163 —

Year.	Originating freight tonnage.	Average tonnage per freight train.
1929	1 339 millions.	804 tons.
1930	1 153 —	784 —
1931	894 —	733 —
1932	646 —	663 —

b) *Road competition.*

One of the most serious features affecting the railways of the U.S.A. has been the growth of road competition.

In passenger traffic, it is not so much the omnibus but the private car which has played havoc with railway receipts, and it was estimated by the President of the Institute of Economics at Washington, in 1933, that 75 % of the loss in passenger traffic by the American railways during the previous ten years was due to the private car. In the United States where the number of cars per head of population amounts to one in every six, the private car is regarded as a necessity and enormous distances are covered by owners. This has been encouraged by good roads, the low price

of fuel, and the infrequent train services on most of the smaller lines.

It is difficult to see how private car competition can be overcome until the number of cars on the roads tends to produce congestion and render roads impracticable as a method of transit to anyone whose time is valuable. Already short-distance rail traffic has not suffered as much as the longer-distance traffic although this result may be due to season ticket rates having been very low, and in some cases, unprofitable.

c) *Air competition.*

Air competition with its capacity for speed is of great importance in a country where distances are great, and large centres of population often separated by mountainous country.

There were in 1932 over 20 Companies in the United States operating approximately 120 services, over 100 of which were passenger-carrying routes. The route mileage traversed has grown from 8 404 in 1926, to 48 530 in 1932. At the end of that year the United States possessed 7 360 civil aircraft, of which 560 were operating regular commercial services. These services are mainly based on New York and Chicago from which routes radiate in a southerly and westerly direction. In 1932, there were over 2 000 airports in the U.S.A. and over 200 towns were served by commercial air routes carrying either mail, passenger or freight.

These air Companies have relied almost universally on the subsidies received from the Federal Government for the carriage of mails, subsidies which are greater than the revenue derived by the Post Office from the carryings of such mail. In 1932 the Government paid to the Air Companies over £ 6 000 000 for domestic and foreign mail transport while the revenue received by the Post Office amounted to barely £ 1 500 000.

This prodigality has been defended by past Governments on the grounds that it is essential that civil aviation should be given every support, but the President of the United States recently cancelled the contracts and instituted enquiries into the whole question of air subsidies.

The above subsidies combined with the facilities for night flying afforded by lighted airways, have enabled the Air Companies to compete with success for passenger traffic. High-speed services are provided with planes of moderate dimensions, and a regular hourly service is operated between New York and Washington, a distance of only 200 miles. Prior to 1932 this service was worked at a profit, without mail subsidies, but in that year it was unable to withstand the effects of trade depression, and the undertaking was sold to Eastern Air Transport, a mail-subsidised Company.

In 1932, the Air Companies of the United States are said to have carried 540 681 passengers, 715 tons of freight and 3 531 tons of mails. In view of these figures, and the increasing demand for high-speed transport, the railways have taken steps to meet the situation not only by accelerating their passenger trains, but by making a number of interchange agreements with the Air Companies. For example, a rail-air service is maintained daily from Chicago, Detroit, St. Louis and Cincinnati to Washington, the Pennsylvania Railroad providing the train service to Pittsburgh, whence the Pennsylvania Air Lines Company takes the passengers forward by air to Washington. No cases, however, have yet occurred of Railway Companies operating their own services.

2. — Legislative assistance received by the railways.

a) *General legislation.*

In 1931 the railways petitioned the Interstate Commerce Commission for

permission to raise freights by 15 %. This application was refused, but the Commission were not unsympathetic and agreed to certain rates being temporarily and fractionally raised on specified commodities (agricultural products being largely excepted) on the understanding that the revenue increases therefrom should be paid into a specially formed Company — the Railroad Credit Corporation which would utilise the funds thus obtained to assist those lines which were unable to meet their fixed charges. This Company started in January, 1932.

Traffic continued to fall, and the Railroad Credit Corporation was unable to meet the demands for assistance which were made upon it; in the year 1932 the additional revenue earned as a result of the increase in rates amounted to $ 64 000 000, an amount considerably short of what had been anticipated, while loans were applied for up to $ 106 000 000.

A more effective form of public assistance was the Reconstruction Finance Corporation also formed in January, 1932, which provided for financial assistance to the railways out of Government funds, « to aid in the temporary financing of railroads and railways in process of construction, and to receivers of such railroads and railways ». Application for loans had to be made by the railways through the Interstate Commerce Commission before being considered by the Reconstruction Finance Corporation itself.

The continued decline in receipts made these measures ineffective, and in June, 1933, the Roosevelt administration passed the Emergency Railroad Transportation Act.

This Act formed part of the Government's general recovery programme but, as its name implies it was not intended to be more than a temporary measure, nor a final solution of the railway problem. Under this Act, a Federal Co-ordinator of Transportation was appointed « to foster and protect interstate commerce in relation to railroad transportation by preventing and relieving obstructions and burdens thereon resulting from the present acute economic emergency, and in order to safeguard and maintain an adequate national system of transportation ». The objects of the Act were :

1. To encourage and promote action on the part of the carriers and subsidiaries subject to the Interstate Commerce Act, as amended, which will :

a) Avoid unnecessary duplication of services and facilities of whatsoever nature and permit the joint use of terminal and trackage requisite to such joint use;

b) Control allowances, accessorial services and the charges therefor and other practices affecting services or operation, and

c) Avoid other waste and preventible expense.

2. To promote financial re-organisation of the carriers with due regard to the legal rights, so as to reduce fixed charges to the extent required by the public interest and improve carrier credit, and

3. To provide for the immediate study of other means of improving conditions surrounding transportation in all its forms, and the preparation of plans therefor.

Te Co-ordinator was instructed « forthwith to investigate and consider means of improving transportation conditions throughout the country, including cost finding in rail transportation and the ability, financial or otherwise, of the carriers to improve their properties and to furnish service and charge rates which will promote the commerce and industry of the country and including also the stability of railroad labour employed and other improvement of railroad labour conditions and relations ».

Certain permanent as distinct from temporary changes were brought about by the Act, notably as regards the jurisdiction of the Interstate Commerce Commission in regard to railway amalgamation and the acquisition of control of one railway by another, the Commission's power to authorise such amalgamation being somewhat extended.

The most important, however, of the permanent changes brought about by the Act is the abolition of the principle of a « fair return » as a basis for the fixing of rates. This principle, which was introduced by the Transportation Act of 1920, may be compared with the Standard Revenue provisions of the British Railways Act. Instead, however, of taking the receipts for an earlier year as in Great Britain as the basis for the fixing of rates, rates in America were to be so fixed that the railways should be enabled to earn a « fair return » on the aggregate value of their property. This « fair return », which was fixed at 5 3/4 %, the railways on the whole had failed to achieve by quite substantial margins, as is shewn by the following figures which are the percentage return by the Class 1 railways on the aggregate value of their property.

1929	4.84 %
1930	3.30 %
1931	2.00 %
1932	1.55 %

A few Companies, however, mostly small ones, had earned their « fair return » and under the so-called re-capture clause were obliged to hand over part of the surplus funds over and above the 5 3/4 % to the Government. Some railways had paid the sums due, others had refused owing to disputes as to the amount to be paid. Under the 1933 Act, the system of the « fair return » was abolished and such moneys as had been paid over to the Government were returned to the Companies concerned and all legal proceedings in connection with the payment or non-payment of similar sums by other Companies were allowed to lapse.

In place of the old system of fixing rates, thus abolished, instructions were issued to the Interstate Commerce Commission as follows :

In the exercice of its power to prescribe just and reasonable rates, the Commission shall give due consideration to the effect of rates on the movement of traffic; to the need in the public interest of adequate and efficient railway transportation service at the lowest cost consistent with the furnishing of such service, and to the need of revenue sufficient to enable the carriers, under honest economical and efficient management, to provide such service.

Once, therefore, the original valuations have been completed, the work of valuation as such shall cease; the Interstate Commission however is to be informed currently of all new construction, extension, or improvement affecting the original valuation.

The temporary or emergency measures of the Act are undertaken principally by the Co-ordinator, who is assisted by three regional Co-ordinating Committees, each of them composed of five members representing the Class 1 railways in the area concerned and two members representing the other railways, steam and electric respectively. These Committees are to undertake such measures as in their judgment are necessary to carry out the provisions of the Act, and if the required steps are not taken voluntarily the Co-ordinator can exercice the necessary powers to compel the parties concerned to carry out what is desired.

The Co-ordinator has wide powers and can over-ride certain existing legislation, but there is a provision that « any interested party » may ask the Interstate Commerce Commission to review any order which the Co-ordinator may have given, and such order is suspended while the review is being made.

Certain special provisions are also contained in the Act affecting the employment of labour. For each of the three railway groups a Labour Committee is set up consisting of representatives of the Railway Companies and of the employees. Any action contemplated by the Co-ordinator affecting the employees' interests must be referred to the appropriate Labour Committee. The railways are forbidden by the Act to reduce the number of their staff below the level of May, 1933, except insofar as such reduction is due to vacancies occurring in the usual way.

Finally, provision is made in the Act for the fining of any individuals or companies who may fail to comply with the instructions issued by the Co-ordinator or his Committee.

It is expected that savings will be made under some of the following heads :

a) Elimination of competitive passenger train services;

b) Elimination of circuitous routing of freight services;

c) The creation of joint terminal facilities.

Hitherto progress has been limited to the investigation by the Co-ordinator into the various phases of the situation. An enormous amount of work is entailed in this task, and immediate measures to deal with the situation can hardly be expected.

b) *Legislation specially directed toward road competition.*

So far as control of road traffic is concerned nothing was done by Federal legislation, until the Roosevelt administration came into power in 1933, when to eliminate the unfair competition of low wages, long hours and bad working conditions associated with road transport operation, a « code » was drawn up to be imposed on the Road Operators, both passenger and freight, under the National Industrial Recovery Act. Difficulties were experienced in negotiating with the freight hauliers owing to the non-existence of any one organisation representative of the trade, although it has been found that the more responsible hauliers are strongly in favour of a Government-regulated code, as they themselves have suffered to a considerable degree from the somewhat irregular and disreputable tactics employed by some of the hauliers of smaller standing.

Separate codes have been drawn up for passenger and freight traffic, the former, or bus code, which became effective as from 13th November, 1933, ruling that all bus operators must register with the bus code authority and must supply full details of the service provided, the fares charged and the wages paid. It also imposes a limit on the number of hours employees can be rostered to work, and a minimum rate of wage.

The freight road operating (or « trucking ») code has, amongst its principal features :

a) The establishment of a National Trucking Code Authority functioning through classified regional authorities;

b) The provision of the 48-hour week;

c) The establishment of a sliding scale of minimum wage;

d) The obligation upon all truck owners to register with the Autority and to provide full information as to service provided, rates charged and wages paid;

e) Permission to groups of Road Operators to make agreements amongst themselves as to rates to be charged provided that such rates are related to existing rates already approved for railway or other road transport services by Federal or State regulating bodies. All rate agreements must be submitted to the appropriate Code authority for approval or otherwise and similarly all amendments to existing rates.

It is expected that the strict application of the codes will have a beneficial effect on the railway position, although it must be appreciated that the difficulties of enforcing such a code are considerable.

As regards legislation passed by individual States affecting road transport, a good deal has been done in this respect but it will be appreciated that it would be a task beyond the scope of this report to detail the manifold regulations imposed by every one of the 48 States of the Union. Considerable opposition has been raised against the various laws which have been passed, on the grounds that they are unconstitutional but in most cases the legislation has been upheld, and there is a growing feeling amongst all classes of the population as a whole, in contrast to the attitude which was generally common a few years ago, that it is in the community's interest that some further degree of restriction and regulation of road transport operation should take place in order to reduce the economic waste incidental to dual transport operation over competitive and parallel routes.

3. — Measures taken by the railways to meet the situation.

a) *Co-ordination between road and rail.*

The activities of the railways in the direction of co-operation with existing road transport companies as well as the provision of their own road services, naturally fall into the two categories of passenger and freight, the policy in the case of the former being to substitute road services for former rail services on branch lines and to link up the main railway routes with surrounding districts with which the railways were previously out of touch, and in the case of the latter to provide door-to-door transit by the combined use of rail and road services.

As regards freight traffic, the serious inroads made by road transport operation into the revenues accruing to the railways from less-than-carload traffic have resulted in extensive experiments being carried out by various railways in the direction of providing their own collection and delivery services at each end of the rail journey, services which had hitherto been performed by independent collection and delivery companies, not by the railways themselves, who had merely provided a station to station rail transit. Although individual practice differs, the vital point in connection with these services is that where the length of rail-haul does not exceed 260 miles, the railways perform the collection and delivery without any additional charge over and above the existing station to station rail rates, on the principle that if they are to retain traffic at all, a door-to-door service is essential. The extent to which these experiments have been a success or otherwise is a question to which at this stage it is not possible to give a definite answer, and very divergent views on the subject have been expressed by leading railwaymen. This conflict of opinion can perhaps best be illustrated by the correspondence which took place in September, 1933, between the Federal Co-ordinator of transportation and the Presidents respectively of the Pennsylvania and New York Central Companies. The former asked the Co-ordinator for permission for that Company to establish generally throughout its whole area a system of collection and delivery services which would aim at providing door-to-door transit of freight. He pointed out that similar systems had already been in operation on other railways in certain areas, and that the experience gained to date certainly indicated the desirability of further development in this direction with a view to providing extensive data upon which a definite decision might ultimately be based as to the desirability or

otherwise of the railways undertaking such service.

The President of the New York Central Lines on the other hand, expressed himself in a letter to the Co-ordinator as being very strongly opposed to railways in general, and the Pennsylvania Company in particular, providing collection and delivery services, on the grounds that this procedure would merely result on competitive collection and delivery companies reducing their charges and in the throughout road transport companies cutting their throughout rates, the ultimate effect being that existing road and rail competition would be intensified rates would be cut wholesale to mutual disadvantage, and in the net result the railways would find themselves no better off, even if they were able to recover some of the traffic lost to them. The railways in fact by instituting collection and delivery services, a large proportion of which were provided free of charge, were providing a door-to-door service at station to station rates, and had thus in effect adopted a policy of rate cutting in order to prevent diversion of traffic to road hauliers. Furthermore he contended that the Pennsylvania Company's proposal contravened two of the most important provisions of the Emergency Transportation Act, 1933 (to which reference has been made earlier in this report), which laid down that the transport industry as a whole must take such action as would :

a) Avoid duplication of services and facilities of whatsoever nature and

b) Control allowances, accessorial services and charges therefor and other practices affecting service or operation to the end that undue impairment of net earnings may be prevented.

The Pennsylvania Company's proposal would lead to duplication of terminal services and to existing terminal accommodation and premises, provided by the railways at great expense in the past, being rendered to a considerable extent useless. Moreover in a number of cities it was the case that the existing independent carrying companies providing collection and delivery services were better situated geographically to serve the needs of particular industries, and it was therefore in the interests of such industries that these services should continue to be performed by such independent companies rather than by the railways themselves.

The Federal Co-ordinator, after giving full consideration to both points of view, expressed his intention of allowing the Pennsylvania Company's request, and stated that the survey which his department was making into the question of less-than-carload freights had already proceeded far enough to make it clear to him that there existed a demand amongst the traders and public generally for a throughout collection and delivery service, and that the extension by the railways of such service would be warmly welcomed and would result in a considerable increase in the less-than-carload tonnage offered to the railways, which was otherwise in danger of being lost altogether to road hauliers. Moreover he held the view that so far from the adoption of this system resulting in waste due to duplication of terminal facilities, the railways would actually find that they would be enabled to effect considerable economies at their goods stations by effecting delivery themselves as against leaving it to the public to take delivery of their goods with consequent congestion at the stations. As regards the contention that certain independent collection and delivery companies, by establishing depots at convenient places in towns, had virtually established the right to handle the traffic to and from the manufacturers and traders situated adjacent to such depots, he could not agree to this principle, but was of the opinion that

a railway company was entitled to complete freedom in the provision of collection and delivery facilities in the areas served by its trains. Finally the Co-ordinator pointed out that should the results of such experiments as were being made by the railways ultimately shew that it was undesirable that they should perform their own collection and delivery, then it would be time for him to exercise his powers as Co-ordinator in restricting them as he might think fit. In the meantime, however, he was not prepared to discourage any such innovations in view of the evidence provided by the progress already made and of the necessity for further experience being acquired.

The Pennsylvania Company have accordingly proceeded to institute a collection and delivery service with free collection and delivery in respect of goods carried by rail between places up to 260 miles apart, and the results of this experiment by this great railway system will go a long way to enabling a definite decision to be reached on this far-reaching question.

As regards the results which have been experienced by other companies who have already instituted a collection and delivery service of their own, it is difficult to assess the net financial improvements which are claimed to have been the outcome of these services, but it has been found to be the case that where the railways have been able to offer their own door-to-door service the public have taken advantage of it, and increases in less-than-carload traffic have resulted. Whether, however, the additional cost of providing this service has really been met by the increase in gross revenue does not appear to have been definitely established on all systems where it has been tried, and the question remains to be solved whether the railways will ultimately benefit financially by providing this extra service without addition to the existing station to station rates and obtaining an increased gross revenue from the carriage of freight which might otherwise have gone by road, or whether in actual fact the improvement in gross receipts so obtained will be outweighed by the additional cost to the railways of operating the collection and delivery service.

The exponents of this system in the United States employ as one of their favourite arguments the fact that the railways of Great Britain find it to their advantage to provide collection and delivery services, although such services are actually operated at a loss, in order to retain traffic which would otherwise to a very great extent be diverted to road.

As regards the extent to which in the United States the collection and delivery service is provided by the railways free of charge that is to say without addition to the station to station rates, the practice varies considerably, but broadly speaking it may be laid down that these services are performed free of charge in respect of traffic carried by rail between points not exceeding 260 miles distance apart, an extra charge being imposed on freight conveyed by rail over distances exceeding that figure, on the principle that the longer the haul the less is the danger of road competitors securing the traffic. On the other hand, there appears to be a growing feeling that there should be no limit to free delivery, which should be provided, regardless of the length of rail-haul, and it is certainly a fact that road operators are tending to undertake longer hauls, and overnight transits of even 300 miles are becoming quite a common occurrence.

It is impossible to foretell with any degree of accuracy what the outcome will be of this revolutionary experiment in American railway practice, but the indications at present certainly seem to favour universal adoption of the system, and the results obtained by the

Pennsylvania Company, the most recent and perhaps the most important convert to the scheme will be watched with keen and universal interest.

To turn to the passenger side of the question, the necessity has been recognised by the railways generally of correlating rail and road services, and a great deal has been done in various parts of the country in the direction of co-ordinating rail and road companies with a view to withdrawing trains on unprofitable branch lines and substituting omnibus services, and to providing feeder road services working in conjunction with main-line train services. To what extent, however, the various railways who have interested themselves in providing omnibus and coach services have benefited financially from these operations, it is not easy to estimate, as road coach travel in the United States has become so popular that the railways have been virtually compelled to enter the arena of passenger transport by road in order to retain any reasonable proportion of passenger traffic. Consequently the road services in which the railways have either a major or minor interest are not actually confined to short-distance or train-feeding traffic, which constitutes the ideal from a railway standpoint, but consist in many cases of long-distance through routes which in actual fact are competitive with the railway companies' own rail routes.

Perhaps the best example of co-ordination between road and rail in the United States is furnished by the Pennsylvania Greyhound Lines, a company which operates throughout virtually the whole area served by the Pennsylvania Railroad Company, and was formed in 1930 by the amalgamation of several separate road companies, in a number of which the Pennsylvania Company had a financial interest. The Pennsylvania Railroad has a rather less than 50 % interest in the Pennsylvania Greyhound Lines Company, which operates over 5 000 route miles daily and in 1932 completed 17 million bus miles and carried 4 500 000 passengers, with a fleet of 400 motor coaches, each seating 33 passengers. The interesting feature of the service provided by this company lies in the fact that it does not consist by any means solely in comparatively short-distance routes, serving the railway's main lines, but through services are operated without any change of coach over very long distances, a through coach for example running regularly between Pittsburgh and St-Louis, a distance of over 500 miles.

Very close co-operation exists between the Pennsylvania Railroad and the Greyhound Company, schedules are so arranged as to suit the convenience of passengers using both systems on the same journey, and tickets are issued in a large number of the railway company's offices for Greyhound coach services and vice versa.

b) *Reduction in passenger fares.*

The basic standard rail fare operative throughout the United states since the termination of the War until recently was 3.6 cents per mile, but in October, 1933, the western group of railways decided to institute an experimental reduction on this figure, and also to modify the system on which fares had previously been charged. This old system involved the purchase by all passengers of a standard fare ticket at 3.6 cents per mile, a separate supplement being charged for a ticket entitling the passenger to travel in a Pullman parlour and/or sleeping car. The latter supplement is partly retained by the Pullman Company and partly by the Railway Company (the latter proportion being known as the surcharge). In effect the imposition of this surcharge by the railway companies was tantamount to providing two classes of travel and charging a higher price for the better accommodation.

The new system of fares introduced by the western group of railways as from 1st December, 1933, for an experimental period of six months, abolished the Pullman surcharge above-mentioned and reduced the basic fares, a lower basic fare being charged for return than for single journeys. Thus in place of the standard fare of 3.6 cents per mile for all journeys, single or return, the following arrangements are in operation:

Single journeys.

3 cents per mile in Pullman sleeping and/or parlour cars.

2 cents per mile in ordinary non-sleeping cars.

Return journeys.

2 1/2 cents per mile in Pullman sleeping and/or parlour cars, or alternatively 2 cents per mile provided the journey is completed within ten days of commencing the outward journey.

1.8 cents per mile in ordinary non-sleeping coaches.

So far as travel in Pullman sleeping or parlour cars is concerned, a supplement is charged proportionately as to length of journey for a seat or sleeping berth, such supplement being charged by the Pullman Car Company, no proportion of it being taken by the railways.

In addition to the above ordinary fares, excursion fares are offered at approximately 2 1/2 cents per mile, by Pullman parlour or sleeping cars, the availability of the ticket being nine months. Specially reduced fares were also introduced for Christmas and New Year holiday return travel, and a reduction was made of 20 % on Winter excursion fares to the further south-western districts.

It is too early to form any opinion based on the results of the policy outlined above, which is the first step yet taken toward co-ordinated reduction, on an extensive scale, by a large group of railways, and the eastern group of railways have decided in the main to await the outcome of this experiment by the western group before making any decision as to future fares policy. On the other hand it may be noted here that the Long Island Company, which is primarily a short-distance line, intends to continue the reduced season-ticket rates introduced in May, 1932, which have resulted in the fall in gross passenger receipts being appreciably arrested.

There is little doubt that in point of fact the principal cause of the decline in passenger traffic is road competition, especially that of the private car, of which 22 million, or approximately one private car to every six inhabitants, were registered in 1932. This factor of the private car, to which attention has already been drawn in this report, cannot be too strongly emphasised in its effect on the railway problem, since it will be appreciated that it is very difficult to attract to rail the owner of a private car, who habitually uses it for all purposes, as is customary in the United States. Furthermore, where good roads are available, as in the United States, the advantage of speed enjoyed by the railway is very considerably reduced.

As regards omnibus and coach competition, the railways suffer from the disadvantage of having to file with the various Commissions notice of all fare changes, thus warning the road operator beforehand and enabling him to take such steps as he may think fit. This does not apply in the opposite direction, that is to say, the railways receive no warning of road fare reductions, but it is a fact that many of the road fares have been cut to such a low figure as to be unremunerative, and the operators have been forced out of business.

In brief the question governing the reduction of fares in the United States is the same as elsewhere, namely, whether the increase in passenger-miles arising from such reduction will produce

a larger gross revenue than could be obtained by the retention of the existing fares, and whether such increase in gross revenue will cover the operating expenses which may be involved in providing for the additional traffic carried. So severe, however, has been the decline in passenger traffic throughout the country, that the western group of railways came to the conclusion that unless some drastic step was taken, the railways would ultimately find themselves out of the passenger business altogether, and that any measures were justifiable which succeeded in retaining anything like a reasonable degree of passenger traffic. The opposing view hitherto held largely by the eastern group of railways is that the losses in passenger traffic are not attributable to the high fares, but to the increased popularity of the private car and to the preference shewn for road-coach travel on its own merits, apart from cheapness, and that therefore no amount of fare reduction will have any appreciable effect on the situation, while the best policy is to concentrate on reducing operating costs, rather than increase them by offering inducements to increased travel which will not improve the ultimate net revenue position.

It remains to be seen what lessons the present experiment will teach, and it would be imprudent to attempt to forecast the future of railway passenger traffic in the United States, where conditions are in many ways so different from those in other countries, especially in view of the very critical period through which the country is now passing.

c) *Light units for passenger services.*

Until the year 1933, recent development in the United States in respect of light-unit vehicles had tended towards the supersession of the small light-weight units of comparatively moderate power by heavier and more powerful cars capable, if required, of hauling, as trailers, ordinary passenger vehicles of conventional design instead of specially-built light-weight trailers.

The use of light passenger units has been mainly comfined to operation on branch lines, and rather with a view to economy than to development of new traffic. In this connection it may be pointed out that American branch lines may be from 100 to 200 miles long and are very different to their European counterpart. Passenger trains often do not exceed one or two per day and are run largely for mails or parcels, or to comply with the law prohibiting the abandonment of the line.

Recently, however, the possibilities presented by the use of light-weight metals in rolling stock construction have opened the way to the employment of light-weight, streamlined, high-speed multiple units, not so much for branch lines but for main-line routes on which high speeds are practicable, and although development in this direction has been confined to orders, in 1933 by two railways, for three high-speed trains of this kind, the experience gained with them will be of the greatest value in guiding future passenger policy.

Apart from these experimental departures, the year 1933 was notable in that the recent tendency above-mentioned toward the employment of heavy and powerful units for branch line work appears to have veered in the opposite direction, and a number of vehicles were constructed in 1933, which were little more than road coaches adapted for use on rail. In view, however, of the comparatively small number of new light units constructed in 1933, viz., eighteen (including the three high-speed trains mentioned above) it is still impossible to forecast the lines on which future employment of light units will develop, and whether the existing limitations of such vehicles to branch-line use will be removed and their employ-

ment extended to provide special high-speed services between important centres over main-line routes.

d) *Acceleration of trains.*

In the year 1933, a general policy was pursued of accelerating train schedules both passenger and freight, and although these alterations in the timetable took the form of improvements on existing schedules rather than a drastic revision of the whole timetable, it is recognised by the railways that speed is one of the principal advantages which, if vigorously pursued, the rail possesses over the road.

As regards passenger traffic, acceleration of trains has been supplemented by marked improvements in the standard of passenger comfort, notably by the provision of air-conditioning systems in long-distance trains, a development which is becoming an important feature in passenger travel in the United States, and is being widely advertised by the companies with a view to attracting traffic from road and air competitors.

e) *Introduction of smaller wagons.*

In the United States, where hauls are long and a large percentage of the traffic is of a bulk nature, it is policy to have a high average wagon capacity, and in 1932 this had reached the figure of 47.2 tons. The less-than-carload originating traffic on the other hand, was 58 % less in 1932 than in 1929, and the question has arisen whether a wagon of small capacity is desirable to deal with this problem. Reference has already been made in this report to the steps taken by the railways towards recovering this particular traffic by the institution of collection and delivery services, but consideration is also being given to providing smaller wagons, in view of the fact that the average carload for this traffic is barely 2 tons.

One of the principal objections to operating small cars in the United States lies in the difficulties to be expected in working long trains of, say, 125 cars, the majority of which are heavy standard cars of over 40 tons, the remainder being small cars of say, 10 tons. On the other hand, the diversion to road of small consignments has been so serious that it is essential that no possibilities should be neglected of recovering this traffic. If a trader, for example, consigns a load of 5 to 7 tons by road, he is charged the lorry-load rate, which in many cases is no higher than the railway car load rate. On the other hand, if he consigns by rail, the higher less-than-carload rate will be payable. If the railways operated a smaller wagon, and made some adjustment in the scale of rates there is no doubt that they would be in a better position to attract this less-than-carload traffic. As regards the adjustment of rates, what appears to be required is a small-carload rate which is less than the less-than-carload rate, but not greatly in excess of the car-load rate. On the other hand, it may be that the development of the container, three or four of which can be placed on one open wagon, may be the solution of the problem.

No definite policy has yet been decided upon in this respect, and it remains to be seen whether the attempts now being made to recapture less-than-carload traffic by providing collection and delivery service will be supplemented by the institution of the small-capacity car which has been found so advantageous in a number of other countries, and is the standard type of vehicle in Great Britain.

f) *Alterations in methods of working to effect economies and to improve service.*

The drastic economies effected by the railways of the United States to keep pace with the fall in revenue may be gauged from the following table shewing

gross operating revenue and expenses for the years 1929 to 1933.

Year.	Gross operating revenues.	Gross operating expenses.
	Millions of doll.	*Millions of doll.*
1929	6 279	4 506
1930	5 281	3 931
1931	4 188	3 223
1932	3 127	2 403
1933	3 101	2 253
Reduction per cent.	50.6	50.0

Maintenance of permanent way, buildings, etc., has been drastically reduced from an expenditure in 1929 of $ 855 millions to $ 321 millions in 1933. This has been rendered possible by the closing of stations which had become entirely unremunerative, and lines whose upkeep was not warranted by the amount of traffic passing over them. Moreover, the amount of permanent way renewal has been very greatly reduced, especially in respect of « tie » or sleeper renewals. The use of paint on station and other buildings has also been cut down to a minimum, and staffs employed on maintenance work have been similarly reduced in numbers.

As regards maintenance of rolling stock, the expenditure for 1933 was nearly 50 % lower than for 1929. Reductions in traffic and number of trains run resulted in a reduced number of locomotives being required for service, and while locomotives in service have been made to perform a greater daily mileage than previously, other engines withdrawn from service for repairs have been allowed to remain unrepaired, as the continued fall in traffics did not warrant the maintenance of a large fleet of spare locomotives in working order.

Maintenance has similarly been deferred in the case of freight wagons and passenger vehicles, while those that remain in service have been allowed to do so in many cases beyond the stage when in normal circumstances they would have been withdrawn for painting or vernishing. While an adequate standard of upkeep consistent with safety has been maintained, it has been stated that the life of some of these vehicles has been considerably shortened by this lack of attention to all but essentials, and the possibility of a return to prosperity and increased traffics may be viewed with some apprehension from the point of view of expenditure in view of the fact that the railways have entered the year 1934 with one of the lowest reserves of serviceable rolling stock in their history.

As regards signalling equipment, considerable progress has been made in the installation of block signalling apparatus, central or remote traffic controls and various other interlocking arrangements, which have resulted in a saving in labour and a speeding up of traffic with increased economy in working.

On the other hand, there was in 1933 a marked tendency towards abandonment of automatic brake-control of trains, the Pennsylvania Company alone doing away with 1 390 track miles fitted with this system, but retaining the use of the continuous cab signal arrangement. This has resulted in very appreciable economies in working, without any relaxation in the standard of safety. The decision, which has also been taken by a nummer of other lines, is particularly noteworthy in view of the keen interest which is centred at the moment in all railway circles on the various forms of automatic control and warning arrangements designed to assist drivers and increase the standard of train safety. The position in the U. S. A. is broadly this, that where permission has been granted by the Interstate Commerce Commission, the automatic brake-control system has been abandoned, but the continuous cab-signal arrangement retained, while on certain lines, where traffic is light, automatic train control

and signal indication has been discontinued altogether.

4. — The outlook for the future.

It is held by a number of economists that the worst period of world depression has been passed, and the results of railway operation in the United States for 1933, which have only recently been available, certainly indicate that a definite check has been given to the steady decline which had been taking place since 1929. For example, gross freight receipts for 1933 amounted to $ 2 493 millions as compared with $ 2 451 millions for 1932, while gross passenger receipts were $ 331 millions as compared with $ 377 millions in 1932. The latter fall in passenger receipts, however, reveals that the rate of decline in recent years has been materially arrested, as may be seen from the following table of gross passenger receipts.

Year.	Millions of dollars.
1929	873
1930	729
1931	551
1932	377
1933	331

While the severe banking crisis which occurred early in 1933 proved a serious set-back to business generally, the year closed with a feeling of greater optimism than had existed at any time since 1929, and no one will follow the tremendous efforts now being made to restore economic prosperity to the United States with greater keenness or anxiety than the railwaymen, whose chances of improved traffics are so dependent on national recovery, which alone can bring the railways any satisfactory reward for the efforts which they have made and are making to combat adverse circumstances.

* * *

Canada.

Canadian National Railways.

Year.	Gross receipts.	Working expenses.	Net revenue.
	Million doll.	*Million doll.*	*Million doll.*
1929	298	255	43
1930	250	228	22
1931	200	199	1
1932	161	155	6

Year.	Passenger receipts.	Freight receipts.
	Million dollars.	*Million dollars.*
1929	37	212
1930	33	181
1931	23	147
1932	17	119

Canadian Pacific Railway.

Year.	Gross receipts.	Working expenses.	Net revenue.
	Million doll.	*Million doll.*	*Million doll.*
1929	223	178	45
1930	190	151	39
1931	148	122	26
1932	124	104	20

Effects of the crisis. — As the above figures shew, the effects of the crisis on both passenger and freight receipts have been very severely felt in Canada by both the Canadian National and the Canadian Pacific Railways. Both these railways traverse roughly the same territory, and although some measure of co-ordination has recently been effected between them, they were in close competition with each other prior to the crisis throughout almost the whole of their systems, with the result that they were not in a position when revenues dropped to face their difficulties with a united front or to effect the joint and co-operative economies which have subsequently been put into force.

Measures taken to lessen the effects of the crisis. — *a*) In November, 1932, a Joint Executive Committee was formed of representatives of both railways, whose activities have resulted in a large number of economies being effected, notably in the case of the partial pooling of passenger train services between Montreal and Toronto, and Ottawa and Toronto. Other economies have been effected by arranging for certain phases of operation to be amalgamated where previously the two railways acted as separate entities and duplication existed.

This Joint Committee, assisted as it is by a number of Sub-Committees appointed to enquire into all the various activities of the two Companies, may be compared with the organisation set up in the United States under the direction of the Federal Co-ordinator.

b) Passenger fares have been reduced in a number of cases on routes where it is considered desirable to protect the Companies against road competition although no universal policy of fare reduction has been adopted comparable to that now being pursued for example by the railways of the United States.

Special excursion and week-end fares have been introduced.

c) Passenger and freight train services have been drastically curtailed, passenger train mileage in 1933 being approximately 33 % less than in 1929.

Light units. — The use of light-unit vehicles is still virtually in the experimental stage, but in view of the pressing need for economy at the present time it is unlikely that any extensive experiments in this direction will be conducted until the financial position becomes easier. The Canadian National Railways constructed two Diesel engines somes years ago, and have a number of Diesel railcars in service, but no conclusive result appears to have been reached as to their utility.

Road competition. — Road competition both passenger and freight, but especially the latter, is very severe, and no effective legislative control of Road Operators has yet been enacted. In December, 1933, howener, a Conference was held in Ottawa under the chairmanship of the Dominion Minister of Railways and Canals, at which delegates from the various Provinces attended, to discuss the question of the equalisation of the conditions under which road and rail transport was being conducted, and the steps that should be taken to bring about some measure of co-ordination. Unanimity was reached on a number of very important principles affecting the operation of coaches and lorries on the road in respect of rates and fares, conditions of service, licensing of vehicles and a number of kindred subjects. It remains to be seen what effect the provincial Governments see fit to give to the recommendations arrived at this Conference, as the question of legislation on this subject is one which rests primarily with the Provincial and not with the Dominion Government.

At present, however, until such time as legislative control is introduced, the railways will continue to suffer from unregulated and unrestricted road competition, both passenger and freight.

Air competition. — Air competition is not yet as severe in Canada as in the United States, but is nevertheless a factor which must be reckoned with, and already a certain measure of co-ordination exists between the railways and the air service operators, as is the case in the United States.

Argentine railways.

GENERAL REVIEW.

Effects of the crisis.

The crisis has resulted in a general and steady fall in passenger and goods traffics since 1929, and the situation has been aggravated by political disturbances and hitherto unrestricted road competition.

Measures taken to lessen the effect of the crisis.

a) General and thorough economy is practised in all departments.

b) Suburban services have been intensified.

c) Excursion and period cheap tickets have been introduced, but no general fare reduction has taken place except in suburban areas.

d) Goods rates have been reduced between certain points on certain commodities to combat road competition, but no general rate reduction has taken place.

Light units and experimental locomotives.

No appreciable progress or results can be reported except on the Entre Rios Railway, where Sentinel-Cammell units have been running for some time on local services, apparently with success, especially from the aspect of combating road competition.

An articulated oil-burning unit was introduced also on the Entre Rios in 1931, with good results, though no particulars of costs are available.

The Buenos Aires Great Southern are experimenting very fully with Diesel-electric trains and locomotives for local services, and a number of these are now in service, which the Company report are doing very satisfactory work, though it is not apparently established definitely that their operation is ultimately more economical than steam engine working. They are apparently regarded as an alternative to suburban electrification though the locomotives are available and have been used on tests with main-line trains.

Road competition and collaboration.

Road competition does not appear to be so severe in the Argentine as in a number of other countries either in respect of passenger or freight traffic. This may be accounted for by the indifferent roads hitherto in existence and the long hauls made by the railways.

Suburban passenger competition, however, is fairly severe, and legislation is in progress whereby some co-ordination is hoped for in the country's transport arrangements, as hitherto road operators have been allowed to work with practically no control or restrictions of any kind.

The railways themselves have only attempted to run their own road services to a fairly limited extent and co-ordination with existing road companies is practically non-existent owing to the difficulty in coming to any agreement with the large number of unregulated and unregistered private operators, who work as individuals without any central or co-ordinating organisation.

Future outlook.

The Argentine Railways appear to be in a fairly sound condition, and a return to better world economic circumstances will result in their regaining a great deal of the ground which has been lost.

More detailed information follows in respect of the individual railways.

Buenos Aires Great Southern Railway.

Year.	Gross receipts.	Working expenses.	Net receipts.
	£	£	£
1929	13 066 788	8 754 445	4 312 343
1930	12 214 561	8 782 900	3 431 661
1931	11 348 749	7 958 638	3 390 111
1932	10 561 447	7 420 493	3 140 954
1933	10 560 668	7 417 265	3 143 403

Passenger receipts.

Year.	General.	Suburban.	Goods receipts.
	£	£	£
1929	1 918 000	1 225 339	6 799 000
1930	1 890 000	1 236 857	6 144 000
1931	1 824 000	1 238 496	5 513 000
1932	1 489 000	1 186 039	5 357 000
1933	1 462 000	1 146 460	5 386 000

Effects of the crisis. — Passenger traffic both long and short-distance has suffered owing to depression in trade and shortage of money.

Goods traffic has suffered owing to bad trade and bad markets for farmers, also road competition.

Measures taken to lessen the effect of the crisis. — *a)* Strict economy has been practised, small stations have been closed or amalgamated and certain branch lines have been closed on Sundays.

b) Automatic signalling has been extended;

c) Motor-trollies have been introduced for permanent way gangs, resulting in staff reductions and general saving;

d) Special excursion and week-end fares have been introduced;

e) Train services have been accelerated and local services intensified;

f) Goods rates have been reduced on certain commodities to combat road competition, with good results.

Light units. — *a)* Five Diesel-electric local trains and a number of locomotives are in operation, which are giving good results in providing a fast and intensive suburban service, the locomotives having also undergone tests with main-line trains.

b) A one-class train consisting of two coaches and a small steam locomotive on a 70-mile branch line is giving fair results;

Road competition and co-ordination. — *a)* In the Buenos Aires area, the company operates motor vans for parcels and small goods to and from railway terminal stations;

b) No operation of road vehicles, or collaboration with road companies, is taking place elsewhere.

Buenos Aires and Pacific.

Year.	Gross receipts.	Working. expenses.	Net receipts.
	£	£	£
1929	9 134 333	6 436 223	2 698 110
1930	7 854 906	5 715 966	2.138 940
1931	7 067 293	5 557 376	1 509 917
1932	6 473 312	5 047 514	1 425 798
1933	5 827 691	4 835 125	992 566

Year.	Passenger receipts.	Goods receipts.
	£	£
1929	1 425 944	6 953 473
1930	1 303 094	5 706 716
1931	1 127 743	5 128 838
1932	911 015	4 914 114
1933	866 546	4 234 518

Effects of the crisis. — The crisis has resulted in :

a) A fall in passenger traffic chiefly due to general trade depression, partly to road competition;

b) A fall in goods traffic from the same source.

Measures taken to lessen the effects of the crisis. — *a)* Strict economy is practised in all departments;

b) Passenger and goods trains have been accelerated;

c) Excursion services have been introduced and fares have been reduced on lines where railcar services are operated;

d) A high standard of luxury has been introduced on certain express trains, on which bathrooms, hairdressing saloons, radio and orchestra are new features.

Light units. — Two railcars are in service and an extension of their use is contemplated both as regards passenger traffic and the carriage of milk from rural districts.

Road competition. — *a)* The Company, in common with others, is await-

ing legislation now before Government to co-ordinate transport and reduce wasteful competition;

b) The Company does not run its own services, but co-operates closely with road companies in respect of both passenger and goods traffic.

Buenos Aires Western.

Year.	Gross receipts.	Working. expenses.	Net receipts.
	£	£	£
1929	5 275 311	3 457 808	1 817 503
1930	4 381 349	3 340 693	1 040 656
1931	3 822 119	3 042 465	779 654
1932	3 729 929	2 904 596	825 333
1933	3 546 426	2 893 941	652 485

Year.	Passenger receipts.	Goods receipts.
	£	£
1929	1 164 730	2 603 937
1930	1 124 811	1 889 369
1931	1 025 641	1 618 408
1932	877 018	1 697 163
1933	767 940	1 589 718

Effects of the crisis. — The crisis has resulted in a fall in passenger traffic both long and short distance, and a fall in freight traffic due to general trade depression, accentuated by road competition.

Measures taken to lessen the effect of the crisis. — *a)* Strict economies are practised in all departments;

b) Very close co-operation is being effected with the Buenos Aires Great Southern Railway in carrying out mutual economies, and so far as operating personnel is concerned, a number of important posts have been amalgamated;

c) Passenger services have been improved and intensified.

Light units. — A Sentinel steam coach has been operating successfully for some years and two modern Diesel-electric units are on order.

Road competition. — *a)* This is severe, especially in suburban passenger areas;

b) The Company has put on a number of goods lorries in certain districts, but have found this unprofitable, owing to the complete lack of restriction on competitors, which it is hoped will be alleviated by the legislation now in progress.

Central Argentine Railway.

Year.	Gross receipts.	Working. expenses.	Net receipts.
	£	£	£
1929	14 251 698	9 817 897	4 433 801
1930	11 567 717	8 639 855	2 927 862
1931	11 196 658	8 181 903	3 014 755
1932	11 405 739	8 227 300	3 178 439
1933	9 749 195	7 849 021	1 900 174

Year.	Passenger receipts.	Goods receipts.
	£	£
1929	3 416 000	9 669 000
1930	3 387 000	7 151 000
1931	3 012 000	7 106 000
1932	2 674 000	7 736 000
1933	2 383 000	6 196 000

Effects of the crisis. — Passenger traffic has suffered, especially suburban traffic, where road competition has been very severe. Long-distance traffic has also been affected owing to general depression.

Goods traffic has declined largely owing to the heavy fall in value of cereals and foodstuffs, which are the staple Argentine products.

Measures taken to lessen the effect of the crisis. — Strict economy is practised, staff has been reduced, and a number of small stations have been amalgamated.

The Buenos Aires suburban service, recently completely electrified, has been accelerated and intensified to combat road competition.

Other local passenger trains have been accelerated.

Fares have been reduced in suburban areas, but not on main lines hitherto.

Light units. — These are still in the experimental stage.

Road competition. — The Company does not operate its own collection and delivery services, and collaboration with road transport companies is rendered difficult by lack of good roads, though a start has been made in this direction.

Entre Rios Railway.

Year.	Gross receipts.	Working expenses.	Net receipts.
	£	£	£
1929	1 543 172	986 503	556 669
1930	1 430 209	991 419	438 790
1931	1 416 122	975 818	440 304
1932	1 122 745	822 539	300 206
1933	822 539	741 976	36 943

Year.	Passenger receipts.	Goods receipts.
	£	£
1929	236 546	1 105 146
1930	234 969	1 007 645
1931	209 398	1 016 838
1932	171 386	778 907
1933	138 903	507 837

Effect of the crisis. — The crisis has resulted in :

a) A fall in passenger traffic owing to general depression, but not to any appreciable extent to road competition;

b) A fall in goods traffic owing to general depression, accentuated in 1933 by a severe plague of locusts, which destroyed the cereal crop. Road competition is not very serious.

Measures taken to lessen the effect of the crisis. — *a)* Strict economy is practised in all departments;

b) Fast excursion trains are run from the country to Buenos Aires, at very low fares, and these are very well patronised. This policy is being pursued.

Light units. — *a)* Two Sentinel-Cammell units were put into service in 1930 and this policy has been further extended, with very satisfactory results in combating road competition.

The fares on these services have been reduced.

b) An articulated oil-burning coach was introduced in 1931 for local traffic, with satisfactory results.

Road competition. — *a)* The Company performs its own collection and delivery services in certain districts where road competition threatened a loss of traffic;

b) No co-ordination with road companies has been effected.

Brazil.

Great Western of Brazil.

Year.	Gross receipts.	Rate of exchange per milreis.	Working expenses.	Net receipts.
	£	Pence.	£	£
1929	976 424	5.89	715 984	260 440
1930	701 223	5.34	588 080	113 143
1931	426 921	3.92	394 379	32 542
1932	576 820	4.83	482 041	94 779

Year.	Passenger receipts.	Goods receipts and tonnage.	
		Receipts.	Tons.
	£	£	
1929	183 106	714 290	2 144 784
1930	131 513	510 045	1 919 904
1931	87 603	306 632	1 447 287
1932	117 190	418 730	1 656 759

Effects of the crisis. — Passenger and goods receipts fell in 1930, largely owing to political troubles and a fall in the exchange rate of the milreis.

In 1931, the exchange rate fell from 5.34 d. per milreis to 3.92 d., due to world depression, and political troubles, and as the Company's results are expressed in pounds sterling, this factor had a naturally adverse effect on the net position, and these losses in exchange are reflected in the sterling figures shewn.

Actually the railway is primarily a goods-carrying line, agricultural produce, cotton, coffee and sugar being the principal goods conveyed from the interior to the coast, and the results of the world crisis do not appear ta have been directly reflected in any serious fall in tonnage handled, but the financial results for 1932 shew a considerable reduction on 1929 when expressed in £ sterling, owing to fluctuation in the rate of exchange which itself is due to a large extent to world depression.

Road competition. — This is severe in respect of goods traffic, but has been combated with considerable success by rate reductions. No co-ordination with road companies has been effected.

Light units. — Nothing has hitherto been done in this direction.

* * *

Uruguay.

Central Uruguay Railway of Montevideo.

Year.	Gross receipts.	Working. expenses.	Net receipts.
	£	£	£
1929	1 561 058	1 123 626	437 432
1930	1 621 290	1 192 560	428 730
1931	1 191 023	887 777	303 246
1932	692 504	504 746	187 758
1933	785 469	576 168	209 301

Year.	Passenger receipts.	Goods receipts.
	£	£
1929	469 124	1 209 090
1930	480 161	1 160 063
1931	340 705	785 082
1932	217 294	498 282
1933	217 153	565 269

Effects of the crisis. — The economic position in Uruguay has steadily degenerated in the past five years, and although the Company's results are published in pounds sterling and thus are affected by fluctuations in the rate of exchange, both passenger and goods receipts have declined in sympathy with the trade of the country.

Measures taken to lessen the effect of the crisis. — Economies have been effected to a degree beyond which it is almost impossible to go, consistent with safety, and trains have been decelerated.

Light units. — Nothing has been done in this direction.

Road competition. — This has been fairly severe until the last year, when the poverty of the country, combined with the high price of lorries, spare parts and tyres, resulted in a reduction in the number of lorries operated.

With a return to economic prosperity, however, there is no doubt that road competition will again become a problem.

The Company is endeavouring, by the provision of lorry services, to « feed » the railway from adjoining districts, and prevent agricultural produce being loaded by road throughout. It is pointed out to the farmers that the railway is more reliable as a means of transport, the difficulty being to induce the farmer to go to the trouble of carrying his goods to the railway station.

* * *

Ireland.

Great Northern Railway (Ireland).

Year.	Gross receipts.	Working expenses.	Net receipts.
	£	£	£
1929	1 662 689	1 387 297	275 392
1930	1 623 822	1 436 106	187 716
1931	1 558 172	1 378 958	179 214
1932	1 389 912	1 360 954	28 958
1933	1 003 534	1 075 469	71 735 *debit.*

Effects of the crisis. — The world crisis has had its effect on both goods and passenger receipts, whose decline has been accentuated by local economic and political difficulties, part of the railway operating in the Irish Free State and part in Northern Ireland, between which, as between England and the Free State, a severe customs barrier exists. In the Free State, both agriculture and other industries are in a serious plight and purchasing power has been very much reduced.

Severe and protracted labour troubles took place in 1933 and reduced services were operated for a long period.

Measures taken to lessen the effect of the crisis. — *a)* Strict economies have been practised in all directions, including the amalgamation of the Mechanical and Civil Engineering Departments;

b) A steady policy of passenger and freight train acceleration has been followed, a number of passenger trains being scheduled daily at average speeds of 55 miles an hour or over between different points, which has proved effective in combating road competition;

c) A number of branch lines have been closed to goods and/or passenger traffic, goods traffic in these cases being concentrated at convenient railhead points and distributed thence by motor lorries.

The passenger services have been replaced by road omnibus services operated by the Company;

d) Door to door services have been established for goods traffic, the traffic being conveyed by express freight trains to and from centres which have been selected as suitable railhead points, which themselves are connected by road lorries with the surrounding area. This concentration of traffic has reduced operating and handling costs and has enabled a number of small goods stations to be closed;

e) Fares have been reduced, the third-class return fare being on a basis of less than 1d. per mile. A variety of excursion fares is also offered, including evening trips to seaside resorts, which have been very successful. Combined rail, steamer, and hotel fares have also been introduced;

f) All main-line trains are equipped with restaurant car or light refreshment services, a small kitchen pantry being employed for the latter, from which refreshments are distributed throughout the trains;

g) Specially reduced goods rates are in operation to combat road competition.

Light units. — Diesel-electric and Diesel-mechanical railcars have been introduced on branch lines and as supplementary units on main lines.

Experiments are also being conducted in the adaptation by a special cheap process, of road buses for use on rails.

Road competition. — In addition to the freight lorry services already referred to, the Company operates road motor passenger services throughout the area traversed by the system, principally as feeder services for the railway.

Legislation has been passed in the Free State whereby the activities of independent road hauliers both passenger and freight, are controlled by Authority, and similar measures are contemplated in Northern Ireland.

The Free State legislature in its Road Transport Act of 1933 advanced probably as far as any other country towards the regulation of road transport, road hauliers having to apply for a license to operate any service over any length of route (except in certain specified areas) and to furnish a statement of the commodities it is proposed to carry.

Great Southern Railways (Ireland)

Year.	Gross receipts.	Working. expenses.	Net receipts.
	£	£	£
1929	4 139 458	3 322 097	817 361
1930	3 961 813	3 247 855	713 958
1931	3 617 148	2 991 836	625 312
1932	3 172 460	2 767 707	404 753
1933	3 000 216	2 678 344	321 872

Effects of the crisis. — The Irish Free State in which this railway operates is primarily an agricultural country, with very little heavy industry. The large towns are situated on the coast, and coal naturally passes by sea direct. The general depression coupled with political difficulties and a heavy tariff between the Irish Free State and England has brought agriculture to a very low ebb, and this combined with road competition has gravely reduced the company's receipts from all classes of traffic.

Measures taken to lessen the effect of the crisis. — *a)* Strict economy is practised in all departments;

b) Passenger services have been curtailed especially on branch lines passing through districts where the population is widely scattered, and where it is very difficult to combat road competition;

c) Special reduced and excursion fares have been introduced, also contract tickets enabling the holder to travel at will in specified areas;

d) Third-class Pullman cars, with low supplementary fares, are in service on the main lines, to provide attractive accommodation to third-class passengers at a moderate price, in addition to the restaurant car services provided on mail and boat trains;

e) Railhead distribution of goods by motor lorry has been instituted;

f) A considerable mileage of main line which was previously double-track, has been converted to single track, and is worked on the electric staff system.

Light units. — A self-propelled light unit on the Drumm battery principle is in operation on local services in the Dublin district, it is understood with satisfactory results.

Road competition. — The nature of the country and a good road system lend themselves to road motor operation, and the competition from this source is very severe, although legislation has effected a considerable measure of control on the activities of road operators, as has been mentioned in the report on the Great Northern of Ireland system. The Great Southern Company has acquired and operates a considerable number of its own road services, both passenger and freight.

* * *

British Africa.

South African Railways and Harbours.

Year.	Gross railway receipts.	Railway working expenses.	Net railway receipts.
	£	£	£
1929	26 090 712	20 298 664	5 792 048
1930	26 130 549	20 878 539	5 252 010
1931	24 321 854	19 308 444	5 013 410
1932	22 039 659	17 604 116	4 435 543
1933	20 619 878	15 591 054	5 028 824

Year.	Passenger receipts.	Goods receipts.	Coal receipts.
	£	£	£
1929	5 546 615	14 548 481	3 817 000
1930	5 426 670	14 567 578	3 893 000
1931	5 106 563	13 620 400	3 462 000
1932	4 685 617	12 372 135	2 959 000
1933	4 107 169	11 887 298	2 661 000

Effects of the crisis. — The effects of the crisis are reflected in the steady fall in passenger and freight receipts, accentuated by road competition, both animal and motor.

Measures taken to lessen the effect of the crisis. — *a)* General economies are practised;

b) Passenger and freight services have been accelerated generally, railcars being substituted to an extensive degree for ordinary trains on branch lines. The electrified lines in the Cape Peninsula suburban area have been extended, as the congested state of the roads makes reliable road transport impracticable, and an intensive electric train service fully justifies itself in the circumstances;

c) Fares on the whole compare very favourably in cheapness with railway fares in other countries, and fares have only been reduced in certain suburban areas with the specific object of combating road competition;

d) Considerable improvements have been effected in passenger rolling stock and the amenities of travel generally.

Light units. — 25 railcars are in operation over 22 different routes; in 1933 the vehicle mileage accomplished was 485 000 and 170 695 passengers were carried.

These cars are run on branch lines where a frequent service of steam trains cannot be economically maintained.

The cars are all 150 horse-power or less, and it has been decided not to run any more of this type, owing to their limitations in respect of hauling trailers to deal with rushes of traffic, and their low speed.

Two new cars are on order, one of 300 H.P. and the other of 400 H.P. with a carrying capacity of 52 and 75 passengers respectively.

Diesel engines have been contemplated, but it is felt that too little is yet known of their capacity and efficiency, and the experiments being carried out in other countries are being closely watched.

Road competition. — This takes three forms :

a) Indiscriminate taxi, or small omnibus services;

b) Animal transport;

c) Privately-owned motor transport by farmers and traders themselves.

As regards *a)*, legislation was passed in 1932, which brought about an effective measure of control, through the establishment of Licensing Authorities, on road operators, but these « taxi » vehicles were excluded from the scope of the Act. They take the form of cars or omnibuses conveying not more than 7 persons including the driver, and are operated at irregular intervals and over indiscriminate routes without any prearranged time table. In a number of cases their activities are illegal but it has been found very difficult to control them.

These have had a serious effect on the Administration's passenger traffic.

As regards *c)* the position is that the

owners of goods road vehicles obtain the « cream » of the traffic, i. e., the higher-rated commodities, leaving the railway company the lower-rated traffic.

It is felt that nothing really effective can be done by the Administration itself to remedy this state of affairs, which can only be adjusted by further and more effective legislation.

Reduction in rates would have no good effect, as the road hauliers would still retain a good proportion of the more valuable traffic, and the Administration's revenue in respect of the lower-rated traffic would naturally suffer still further.

The Administration operates a large fleet of road vehicles, both passenger and freight, a total of 4 580 000 vehicle-miles being performed in 1933 by 496 vehicles over a route mileage of 10 036.

Of these 496 vehicles, 67 are passenger coaches, 230 are combined passenger and goods vehicles, 100 are goods lorries, and 99 are goods trailers. In 1933, 1 990 000 passengers were carried, and 226 000 tons of goods.

In 1931, this service was operated at a loss of £ 25 000, which was changed, however, in 1932 to a profit of £ 3 339 and in 1933 of £ 4 768. The sudden change from loss to profit is accounted for by the legislation which, as mentioned previously, was passed in 1932, and which placed a considerable measure of control over the indiscriminate running of road vehicles by private owners, although, as previously remarked, this legislation still falls short of what is necessary.

Kenya & Uganda Railways and Harbours.

Year.	Gross receipts.	Working. expenses.	Net receipts.
	£	£	£
1929	2 448 960	1 445 070	1 003 890
1930	2 214 229	1 441 285	772 944
1931	1 903 726	1 300 805	602 921
1932	1 838 661	1 044 161	794 500

Effects of the crisis. — Passenger receipts in 1932 were approximately 20 % lower than in 1929.

Goods receipts were approximately 12 % below 1929.

Measures taken to lessen the effect of the crisis. — *a)* A number of purely crossing stations have been closed and the sections thereby lengthened;

b) Strict economy is practised in all departments;

c) Passenger trains and goods services have been accelerated;

d) Excursion trains and fares have been introduced;

e) Feeder services by road lorries are in operation.

Light units. — Attempts have been made to operate a « ro-railer » or goods vehicle to run either on rail or road, but these have had to be abandoned owing to mechanical difficulties.

Road competition. — This is practically non-existent, as legislation passed annually for one-year periods affords complete protection.

Co-operation with road companies is limited to the employment of cartage agents at certain places.

Nigerian Railway.

Year.	Gross receipts.	Working. expenses.	Net receipts.
	£	£	£
1930	2 692 661	1 665 716	1 036 945
1931	2 154 731	1 313 209	841 522
1932	1 837 977	1 162 252	675 725
1933	1 870 426	1 086 136	784 290

Effects of the crisis. — Passenger and goods receipts have both been very seriously affected by general depression and by road competition.

Measures taken to lessen the effect of the crisis. — *a)* Nine stations have been closed;

b) Strict economy is practised in all directions;

c) Twelve additional passenger trains have been put into operation since October, 1933, at times arranged by agreement with local authorities;

d) A regular overnight freight service is in operation;

e) The standard third-class fare has been reduced from 1/2 d. to 1/4 d. per mile;

f) A standard flat rate per ton-mile has been introduced in areas where road competition is severe.

Light units. — Two Sentinel-Cammell coaches are being put into operation on suburban services.

Road competition. — *a)* As from the 1st January, 1934, legislation is in force doubling the licence fees on road motors and lorries;

b) Co-ordination with certain of the more reputable road operators has been effected, and joint services are in force.

Egypt.

Egyptian State Railways.

Year.	Gross receipts.	Working expenses.	Net receipts.
	£E.	£E.	£E.
1928-1929	7 163 000	4 192 000	2 971 000
1929-1930	7 039 000	4 076 000	2 963 000
1930-1931	6 038 000	4 077 000	1 961 000
1931-1932	4 939 000	3 624 000	1 315 000
1932-1933	4 743 000	3 274 000	1 469 000

Effects of the crisis. — The effects of the world depression have been felt in Egypt as elsewhere, and road competition has assisted in increasing the railway's difficulties.

Measures taken to lessen the effect of the crisis. — *a)* The strictest economy is practised in all departments;

b) Cheap day return tickets and excursion trains have been introduced;

c) Both express and local trains are timed to start at regular intervals as far as possible;

d) Passenger and goods trains have been generally accelerated.

Light units. — 19 steam railcars are working on secondary lines. These each consist of two articulated vehicles driven by a steam engine which is enclosed in, and forms part of, the vehicles.

These are apparently satisfactory, as it is proposed to increase their number.

Road competition. — The railway being a Government department, co-operation has been encouraged with road interests to a considerable extent, and unfair competition is largely held in check, though passenger road competition is nevertheless severe in certain districts.

The Railway operates a number of « feeder » road vehicles for passengers in connection with main line trains, but does not operate any goods road lorries.

Ceylon.

Ceylon Government Railway.

Year.	Gross receipts.	Working. expenses.	Net receipts.
	Rs.	Rs.	Rs.
1929	32 498 947	25 996 899	6 502 048
1930	29 650 683	25 085 120	4 565 563
1931	25 324 379	23 809 576	1 514 803
1932	22 024 355	21 688 864	335 491

Effects of the crisis. — Both passenger and goods receipts have suffered severely as the result of general depression, accentuated by road competition.

Measures taken to lessen the effect of the crisis. — *a)* General economies are practised;

b) A number of tablet stations have been removed on branch lines, and the sections thus lengthened without any adverse effect on working owing to the infrequency of the train service;

c) Fares have been reduced, the third-class single fare to slightly over 1/3 d. per mile;

d) Special goods rates have been introduced;

e) Trains have been accelerated whenever possible, but in some cases mixed trains have had to be resorted to;

f) In the Colombo suburban area, the running of trains at regular intervals has been arranged.

Light units. — 30 steam railcars are in use and frequent services are run to meet road competition, apparently with success.

Road competition. — Generally speaking, road vehicles are operated by individuals owning two or three vehicles, and co-operation is thus rendered almost impossible.

The administration provides a freight road service at Campola, in the centre of the tea planting district, which conveys tea, etc. from the estates to the railway station and rice etc. in the opposite direction. This service is giving satisfaction and will be extended as circumstances warrant.

Federates Malay States.

Federates Malay States Railways.

Year.	Gross receipts.	Working expenses.	Net receipts.
	$	$	$
1929	20 886 597	19 159 646	1 726 951
1930	17 053 184	17 017 079	36 105
1931	10 991 948	11 635 199	643 251 *debit.*
1932	7 937 473	8 944 763	1 007 290 *debit.*

Effect of the crisis. — Passenger and goods receipts have declined as a result of trade depression, accentuated by road competition.

Measures taken to lessen the effect of the crisis. — *a)* General economies and co-operation between Departments have been effected;

b) Long-distance fares have been reduced to combat coastal steamer competition and short-distance fares have also been reduced;

c) Long-section tablet working has been introduced where practicable, enabling 82 tablet sections operated by day to be worked in 34 sections at night;

d) Three branch lines have been closed, and the areas served by a road motor service for goods and parcel traffic. These services are run at a profit;

e) Passenger and freight services have been accelerated;

f) As regards fares, cheap tickets are available between certain points, and, in addition to special season and traders' tickets, coupon books for 1 000 miles of

travel have been instituted at 20 % discount.

The above concessions have succeeded in obtaining a considerable amount of traffic;

g) Rates have been reduced wherever thought desirable;

h) Buffet cars have been introduced and improved accommodation in trains provided.

Light units. — Six Sentinel steam coaches are in operation on sections of the line where traffic is light, and a frequent service is required.

Road competition. — *a)* No legislation has yet been enacted to assist the railway;

b) Collection and delivery services are in operation at over half the Company's stations, and in several areas the district is linked up with the railway by passenger and goods road motor services;

c) No co-operation is in existence with road operators;

d) The clauses in the Railway Enactment respecting undue preference and the availability of special rates for inspection by the public, have been withdrawn, and the railway is at any rate in theory entitled to quote any rate it wishes to anyone.

* * *

India.

The World crisis has affected all Indian railways though not so much as those of the United States. Both passenger and freight traffic have been affected and the decline has been accentuated by road competition.

Measures taken to lessen the effect of the crisis. — The Railways have made great efforts to reduce expenditure. When the depression started in 1929, the Railway Board impressed upon the different Railway Managements the necessity of taking all possible steps to reduce working expenses. Railways were instructed to make special investigations into methods by which expenditure could be curtailed, viz. : reduction in goods and passenger mileage; economy in coal consumption; more economical use of consumable stores; curtailment of maintenance and repairs; revision and simplification of office procedure so as to reduce costs of stationery, etc.; curtailment of minor new works.

A Railway Retrenchment Committee was set up by the Government of India, who made certain recommendations for reducing expenditure mostly in establishments. Cuts in pay were also made.

Subsequently further steps were taken to reduce expenditure in the following directions :

I. Deputy Agents (i. e., Deputy General Managers) have been appointed on the principal lines to overhaul on job analysis lines all activities and ressources.

II. The methods of scrap reclamation and use have been overhauled and modernised.

III. Intensive use of locomotive power has been practised.

IV. Considerable research activities have been conducted with a view to a greater degree of standardisation in locomotives and carriages and wagons. One of the finest dynamometer cars in the world is in use. Locomotive standards and track standards committees have been at work.

V. Intensive use of coaching stock is being practised.

VI. Crossing stations and signal boxes have been closed.

The steps taken by the Railways to increase their revenue may be summarised as follows :

I. Acceleration and retiming of trains.

II. Reduction in fares; in some cases to as low a figure as 1/4 d. per mile.

III. Introduction of halts;

IV. Reduction in freight rates for certain commodities between certain points.

V. Light units have been put into service, though these have not been found entirely satisfactory owing to liability to mechanical defects as compared with ordinary locomotives, and to inability to cope with rushes of traffic. Experiments, however, are being carried out with larger and more powerful types.

Road competition.

Road transport has grown apace in India, although owing to the physical characteristics of the country such as long distances, the results of competition have not been so severely felt as in other countries. The Government appointed a Committee of Enquiry into the matter of road competition, and the report of this body states that approximately some Rs. 186 lakhs (about £ 1 395 000) is the estimated loss to the principal railways through road competition. The whole question of road and rail co-ordination is receiving the attention of the Government. Most road operators are almost entirely unregulated as regards speed, fares, loads, timetables or conditions of service. The competition has affected passenger travel and smalls and other freight traffic.

Forecast of future.

There are signs that traffic is increasing although this is offset to some extent by the extensive damage which certain railways, notably the Bengal North Western and Eastern Bengal suffered as a result of the earthquake.

New Zealand.

New Zealand Government Railways.

Year.	Gross receipts.	Working expenses.	Net receipts.
	£	£	£
1928-1929	7 524 864	6 374 579	1 150 285
1929-1930	7 473 993	6 848 025	625 968
1930-1931	6 781 387	6 406 143	375 244
1931-1932	5 788 965	5 301 652	487 313
1932-1933	5 339 075	4 833 754	505 321

Effects of the crisis. — Freight receipts have fallen owing to trade depression and road competition.

Passenger traffic has suffered owing to bad trading conditions, and the diversion of passengers to road, especially to private cars.

Measures taken to lessen the effect of the crisis. — *a)* General economies are practised;

b) Ordinary fares were reduced in 1932 by 20 %, resulting in 1933 in a 4.9 % increase in passenger journeys, but a fall in gross revenue of 12.3 % from ordinary tickets;

c) Main-line services have been curtailed, and also branch-line services, except in the more populous districts, where the local services have been accelerated and intensified;

d) Certain branch lines have been closed;

e) Excursion fares have been put into operation between certain points, and excursion trains are run at suitable times and occasions, with considerable success.

Light units. — One railcar was put into operation in 1930, to replace ordinary trains.

Road competition. — The railway operates its own road services, passenger and goods, with the following results :

	£
1929 net loss of . . .	9 328
1930	11 416
1931	5 842
1932	2 951
1933 net profit of . .	521

The change, in 1933, from loss to profit in working is due to legislation restricting the operation of small-capacity passenger road vehicles hitherto run quite indiscriminately without regard to timetables or routes.

The legislation is one of the best and earliest attempts to co-ordinate the functions of rail and road transport, a mileage basis being used as a line of demarcation between rail and road hauliers, the latter being precluded from operating over through routes beyond a certain length without specific authority.

The railway operates its own collection and delivery services in 48 different towns.

* * *

CONCLUSIONS.

a) *General.*

From the above review of railway operations in twelve countries, four important facts emerge :

Firstly, that in every case the crisis has diminished rail revenues.

Secondly, that in all these countries, the situation has been made worse by road competition and the necessity for co-ordination of road and rail transport has been recognised by legislative Authorities.

Thirdly, that the necessity for taking all possible steps to regain traffic and to operate it economically has revived interest in light-unit vehicles.

Fourthly, that intensive efforts to effect economies have led to improved operating methods which might never have been introduced without the stimulant of financial stringency.

b) *Road competition.*

The railways have endeavoured to counteract this in the case of freight traffic by providing door-to-door services through road lorry operation to and from railway stations or railhead distribution points supplemented by the use of containers. In the case of passenger traffic, the competition is most severe for short journeys, except in the United States where the railways have lost more traffic on their long-distance than their short-distance services. This is due to congestion on the roads in the more populated areas, and reduced fares and intensified services introduced by the railways to retain this short-distance traffic.

Generally where the operators of motor vehicles are allowed a free hand to run services, both passenger and freight, without control of rates or fares, conditions of service or publication of timetables, it is almost impossible for the railways to meet their competition. The road operators « cream » the freight traffic, that is to say, they confine themselves to the lighter or less bulky traffic which is highly rated, and leave the heavier low-rated traffic to the railways. On the passenger side, they operate irregular services, at varying fares, between any points they choose, and if a service fails to pay, they withdraw it.

c) *Passenger traffic and light-unit vehicles.*

The development of passenger traffic appears to be taking place on very similar lines in most of the countries under review; accelerations have been made in both long and short-distance traffic; and in suburban areas, or in districts where road competition is severe, train services have been intensified, in some cases by the introduction of light-unit vehicles, and in others by an extension of electrified lines.

As regards the employment of light-unit vehicles, progress generally appears to be somewhat disappointing, and it is difficult to find conclusive evidence of the utility of these vehicles. One of the difficulties appears to be their moderate power and seating capacity which inhibits their use on other than local or branch lines at moderate speeds. Even here it is found that the traffic at certain periods of the day is often too heavy for the light-unit vehicle to deal with even when it is a sufficiently powerful type to permit the attaching of a trailer, with the result that ordinary trains have to be utilised for the peak traffic and the advantage of the light unit is thus diminished. This difficulty has been particularly observed in South Africa and in India where the use of larger and more powerful types is contemplated.

The writer, however, holds the view that there should be considerable possibilities of using railcars of light construction with improved acceleration and braking power, in operating intensive services not only on branch lines but between towns which have an affinity of interest. To overcome the difficulty which tends to arise at peak hours of traffic, some modification in existing operating regulations may be necessary to enable duplicate vehicles to follow at short intervals if the full benefits are to be derived from the utilisation of such vehicles.

In the United States, as has already been noted, attention is being directed toward the possibiliy of very high-powered self-propelled vehicles being employed on high-speed main-line services and the experiments now taking place will be of great interest, in view of similar services now contemplated or in operation in Germany and France.

d) *Passenger fares policy.*

As regards passenger fare reduction with a view to attracting traffic and competing with road transport, there appears to be a universal tendency to provide specially reduced facilities either between specified points or generally over specified periods in an attempt actually to create traffic which otherwise would not offer at all. In most cases, however, this has not involved any reduction in the standard fare, with the notable exception of the United States, where the falling off in passenger traffic has been so serious as to demand desperate remedies. Even in the latter case, however, considerable difference of opinion exists, and the eastern group of lines are awaiting the results of the experiment in wholesale fare reductions which the western group have instituted.

In general, it appears that where fares have been reduced either locally or generally, an increase in the number of passengers carried has followed, but the recent cheap-fare policies in different countries have not yet had time to give conclusive proof of their effectiveness, having regard to the fall in average fares per passenger and the rise in operating costs consequent upon the increase in passenger-miles.

e) *Economies in working.*

A noteworthy feature of the various railway operations under review consists in the reduction in working expenses which have been made.

These economies fall into three classes :

1. Savings effected by the closing of stations and lines.

2. Reduced expenditure on maintenance of rolling stock, permanent way and buildings.

3. Economies effected by the introduction of improved methods of working in various departments.

As regards closing of stations, this has been done by most of the railways under review, and economies have also been made by placing one station mas-

ter in charge of two or more stations, and on single lines by cutting out block posts and extending the sections where traffic has fallen.

Maintenance costs have been cut in most cases, notably in the United States, and although the standard of safety has not been allowed to fall with a return to more prosperous conditions, some of the railways may find themselves rather hard put to it to meet increased demands.

Steady progress has been made in automatic signalling methods to increase line capacity and reduce labour costs, not only on lines where traffic is consistently heavy, but on branch lines in sparsely-populated districts where labour and staff problems present difficulties.

Mention has already been made of the economies effected in the United States by the abandonment of automatic brake-application devices working on the locomotive and the retention of the continuous cab-signalling arrangement whereby the condition of the line ahead is automatically communicated to the driver by a complete system of track-circuiting. This decision is of considerable interest at the present time, and was only taken after the fullest consideration and consultation with the drivers themselves.

No radical changes in locomotive design have taken place except where Diesel traction is being tried, notably on the Buenos Aires Great Southern Railway, where extensive experiments with Diesel-electric passenger trains and locomotives have been in progress for a number of years without conclusive results so far. Progress in locomotive building and running has been confined to improvements on previous designs, standardisation of working parts, and alterations in engine working arrangements whereby engines have been made capable of longer spells of duty without returning to shed, with consequent savings in running power expenditure.

f) *Summary.*

It will be seen from what I have said that the railways all over the world have reacted with great vigour to the double misfortune of road competition and world depression that has fallen on them in recent years. They have shewn immense ingenuity in discovering new sources of economy on the operating side, by the more intensive use of their apparatus and the discovery of new apparatus, to meet changing traffic conditions; on the administrative side by analysis and reclassification of work to be done so as to save labour.

The vigour with which they react to misfortune will not save them as long as the real seat of the trouble is left untouched. As far as the trouble is caused some alleviation at least may be expected to pass with the passing of that depression and there appears to be fairly general agreement among authorities that some alleviation at least may be expected as the economic world enters on the upward phase of the trade cycle although, of course, no permanent improvement can be expected until the various international debts and other barriers to trade are out of the way.

If the depression lifts at all, however, the position of the railways should begin to shew marked improvement because the economies they have made under the stress of critical financial conditions are very largely permanent and will widen whatever margin there may be in the ratio between expenditure and revenue.

The trouble that arises from road competition is more serious and involves political considerations which are very much harder to assess than any arising out of railway working. Every civilised country depends on the railway for its essential services and any form of competition which threatens to destroy those services or even seriously to impair them becomes the immediate concern of the Government of that country.

In some countries road competition

has been fostered by the action of past Governments in building roads which could be used as duplicate tracks for the conveyance of heavy traffic and in those countries the problem of road and rail transport is more acute in consequence.

In each country the Government has reacted differently. In Great Britain the problem has been virtually handed over to the Transport Advisory Council set up by the Act of 1933, whereby it is hoped that a solution may be found to some of the many problems outstanding. In the United States the problem, which was first attacked by Mr. Hoover with the device of a financial pool, has been handed over by Mr. Roosevelt to a Committee of one, the Co-ordinator or Railways. His appointment is, however, comparatively recent, and his first report has not yet reached this country. What the ultimate solution will be it is impossible to say. It may be that some modus vivendi will be found which will enable road and rail transport to exist together with a reasonable degree of prosperity on either side, or it may be that the ultimate solution lies in a single authority controlling all forms of transport.

Whatever the upshot may be, railwaymen will continue to shew by the vigour of their reaction to circumstances, whether adverse or not, the strength they bring to their task and the faithfulness with which they serve the ideal of public service which has been their guide from the beginning.

April 1934.

[656. 222.1]

Note on Train Speeds,

by LIONEL WIENER,
Professor at the University of Brussels.

PART II *(Continued.)* [1]

Train speeds and services in different countries.

II. — FRANCE *(Continued.)*

CHAPTER XVI.

The speeds.

XVI-1. — **Generalities.** — It is interesting to consider the speeds of the best trains, not only on the main express lines, but also on certain other lines, giving examples, sometimes of a short journey, and sometimes of a long non-stop run. Table 102, in which interesting runs on the French railways are given, has been drawn up for this purpose.

XVI-2. — **The fast lines.** — Although they were admirably laid out from the very beginning, the main lines of the French Companies have undergone many alterations, so as to do away, as far as possible, with all causes for reducing speed. The gradients have been reduced, the stations remodelled in order to enable them to be run through at speed, and the curves straightened out. Even when it was impossible to give them any superelevation, as on leaving Creil, where the main line forks to the left for Calais and to the right for Brussels, with radii of 945 m. (47 1/4 chains), the express trains run through the junctions at more than 90 km. (56 miles) an hour without any trouble. The above factors have made it possible to maintain high running speeds over long sections of line, so that the remarkable overall speeds we have quoted were attained.

It would even seem that, in spite of the increased weight of the trains, the last word has not yet been said. The *Paris-Orleans*, which is giving up steam traction, has bequeathed to its sister companies the remarkable results of the trials it has been carrying out during the last three years and which, through alterations made to the exhaust, making it possible to produce up to 20 000 l. (44 000 lb.) of steam per hour, and to the motion, which has poppet valves driven by Walschaerts gear and oscillating cams with large sectional areas through the ports to prevent wire drawing, and finally by

(1) See *Bulletin of the Railway Congress*, October and November 1933, pages 885 and 1027; January and May 1934, pages 63 and 407.

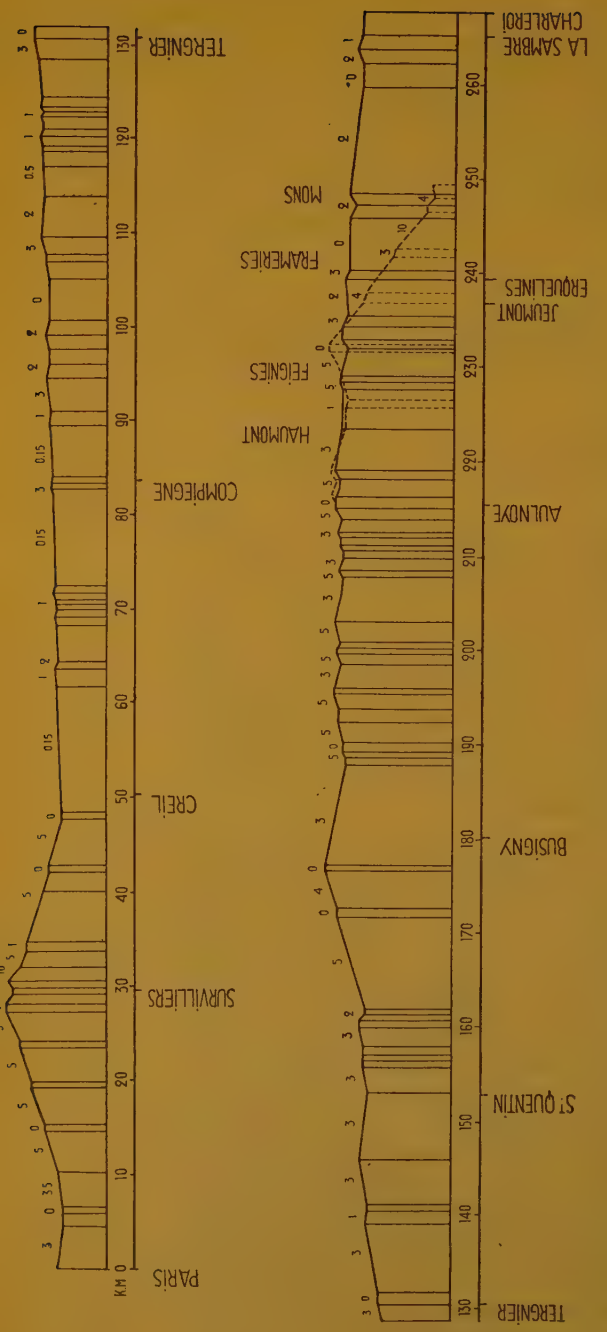


Fig. 59. — Line from Paris to Aulnoye and the Belgian frontier (*Nord* Railway), and from the frontier to Mons and Charleroi (*Nord-Belge* Lines).

other alterations such as pressure increased to 20 hpz. (290 lb. per sq. inch) and superheat brought up to 400° C. (752° F.), increased the power of its locomotives, thus enabling them to haul over up gradients heavier trains at higher speeds than those previously reached. As a result the *Nord*, the *State*, and the *Paris-Lyons-Mediterranean* are carrying out similar alterations to some of their engines, which will enable them to still further accelerate their trains.

They still have to make the Government agree to raise the present speed limit, which for very many years has remained unchanged at 120 km. (75 miles) an hour.

The Nord Railway, which serves the flattest part of France, has always headed the French railways in the matter of speed. Three main traffic currents justify this :

a) the Anglo-French or Franco-Belgian traffic of the lines radiating from Paris towards the Channel Ports or the north-eastern frontier;

b) the traffic from the Channel ports for Switzerland, which is conveyed over the *Nord* and *Est* systems, by using the Amiens - Laon - Chaumont cross-country line;

c) the traffic coming from these same ports and going to Strasbourg, and Alsace, and which follows the frontier via Hirson.

a) These are lines of the first class, technically in excellent condition, and the fastest trains run over them. The line from Calais crosses at Survilliers the ridge separating the valleys of the Seine and the Oise, and it was possible to locate it with a rising gradient and then a down gradient of 1 in 200; there is then a further climb as far as Ganne, followed by a descent onto Amiens, the gradient now being only 4 mm. per m. (1 in 250); the line

Table 102.

NOTABLE FRENCH RUNS.

COMPANY AND RUN.	Distance		Time of departure.	Time spent.	Speed		
	Km.	Miles.			Km./h.	Miles/h.	
Nord.							
Paris-Le Tréport	183	113.8	R 7.28 p. m.	2.37	70	43.5	
Paris-Eu	180	111.9	8.15 a.m.S.	2.07	85	52.8	
Paris-Calais	299	185.8	10.00 a. m.	3.05	97.0	60.3	1 stop.
Do. -Calais	299	185.8	12.00 noon	3.10	94.4	58.7	Golden Arrow.
Do. -Longueau	126	78.3	5.20 p. m.	1.16	99.5	61.8	
Do. -Amiens	131	81.3	R 11.00 a. m.	1.25	92.5	57.5	
Do. -Abbeville	176	109.3	1.15 p. m.	2.00	88.0	54.7	
Do. -Etaples	227	141.0	10.00 a. m.	2.13	102.4	63.6	
Do. -Boulogne (Town)	254	157.8	4.40 p. m.	2.34	98.9	61.6	
(Lille) St-André-Calais	103	64.0	10.50 a. m.	1.07	92.2	57.3	
Paris-Lille	258	160.3	8.15 a. m.	2.40	96.7	60.1	2 stops.
Paris-Arras	199	123.6	Do.	1.54	104.7	65.0	
Paris-Dunkirk	312	193.8	8.16 a. m.	3.37	81.6	50.7	6 stops.
Paris-Hazebrouk	272	167.9	R 7.09 a. m.	2.51	95.6	59.4	Until 1932.
Hazebrouk-Béthune	35	21.7	8.59 a. m.	0.22	95.4	59.2	
Lille-Valenciennes (Hirson)	48	29.8	7.56 a. m.	0.36	80.0	49.7	
Dunkirk Town-Hirson	205	124.6	R 10.19 p. m.	2.16	90.4	56.2	
Aulnoye-Hirson	41	25.5	9.07 a. m.	0.30	82.0	51.0	
(Calais) Etaples-Laon (Rheims)	204	126.8	6.14 p. m.	2.13	92.0	57.2	
(Calais) Amiens-Laon-(Do)	108	67.1	9.34 p. m.	1.18	83 1	51.7	
Paris-Brussels	334	193.2	11.25 a. m.	3.15	95.7	59.4	Etoile du Nord.
Paris-Compiègne	84	52.1	6.24 p. m.	0.51	98.9	61.5	
Do. -St-Quentin	154	95.7	1.36 p. m.	1.28	105.0	65.2	
Do. -Aulnoye	216	134.2	8.00 p. m.	2.06	102.8	63.8	
Paris-Liége	367	228.1	10.10 a. m.	3.50	95.7	59.4	
St-Quentin-Brussels	157	96.5	R 1.28 p. m.	2.00	78.5	48.8	
Do. -Compiègne	70	43.5	R 7.13 p. m.	0.42	100.0	62.1	
Aulnoye-Brussels	95	59.0	10.13 p. m.	1.11	80.3	51.6	
Est.							
Paris-Mézières-Longuyon	331	205.7	2.25 p. m.	4.29	73.9	46.0	Stops.
Paris-La Ferté-sous-Jouarre	66	41.0	7.03 a. m.	0.52	92.3	57.3	
Do. -Meaux	45	28.0	6.00 a. m.	0.34	79.4	49.3	
Do. -Château-Thierry	95	59.0	R 9.09 a. m.	1.08	85.3	53.0	
Do. -Rheims	156	96.9	2.25 p. m.	1.43	90.9	56.5	
Paris-Bar-le-Duc-Metz							
Paris-Longueville	89	55.3	8.00 a. m.	0.58	90.4	56.1	
Do. -Epernay	142	87.2	7.15 a. m.	1.28	96.8	60.1	
Do. -Châlons-sur-Marne	173	107.6	8.53 a. m.	1.53	91.8	57.0	
Do. -Nancy	353	219.4	5.46 p. m.	3.51	91.7	56.9	
Do. -Bar-le-Duc	254	157.8	R 10.10 a. m.	2.30	101.6	63.1	
Paris-Belfort	443	275.3	7.00 a. m.	4.55	90.1	56.5	
Paris-Verneuil l'Etang	53	32.9	11.00 a. m.	0.32	99.0	61.5	
Do. -Troyes	167	103.7	R 6.43 p. m.	1.42	98.2	61.0	
Do. -Bar-sur-Aube	221	137.3	10.50 p. m.	2.38	83.9	52.2	
Do. -Chaumont	262	162.8	R 6.16 a. m.	3.01	86.9	54.0	
			R 9.12 p. m.	2.43	96.4	59.9	

TABLE 102 (*continued*).

COMPANY AND RUN.	Distance		Time of departure.	Time spent.	Speed		
	Km.	Miles.			Km./h.	Miles/h	
Troyes-Chaumont	95	59.0	R 11.05 a. m.	0.58	98.2	60.9	
Do. -Langres	130	80.8	R 6.30 p. m.	1.23	94 0	58.4	
Do. -Belfort	276	171.5	8 51 a. m.	3.04	90 0	55.9	Winter.
Chaumont-Belfort	181	112.2	1.50 p. m.	1.55	94.4	58.5	
Vesoul-Troyes	214	133.0	4 23 p. m.	2.15	95 1	59.1	
ALSACE-LORRAINE.							
Strasbourg-Wissemb. (Wiesbaden)	68	42.3	8 58 a. m.	1.07	61.0	37.9	
Strasbourg-Ingwiller (Sarrebruck)	43	26.7	R 7.25 p. m.	0.32	80.6	50.1	
Strasbourg-Metz-Luxembourg	222	137.9	10.50 a. m.	2.26	92.9	57.8	2 stops.
Strasbourg-Metz	159	99.0	Do.	1.32	103.7	64.4	
Metz-Thionville	30	18.6	12.24 noon	0.20	90.0	55.9	
Strasbourg-Nancy (Paris)	59+91	93.3	R 9.42 p. m.	1.33	96.8	60.2	
Strasbourg-Saint-Dié-Epinal	87+61	91.9	R 5.05 p. m.	2.49	52.6	32.7	5 stops.
Strasbourg-Colmar-Basle	143	88.8	R 9.20 a. m.	1.25	100.9	62.7	Edelw. 1 stop.
Basle-Mulhouse	34	21.1	Do.	0.23	88.7	55.1	Edelweiss.
Mulhouse-Strasbourg	109	67 7	9.44 a. m.	1.01	107.2	66.6	Do.
Basle-Strasbourg-Metz	159	98.8	10.50 a. m.	1 32	103.7	65.5	Edelweiss.
(Paris) Belfort-Mulhouse	14+35	36.7	1.03 p. m.	0.33	89.1	55.3	
P.-L.-M.							
Paris-Marseilles	863	536.3	9.00 a. m.	10.16	84.2	52.3	Côte d'Az. Exp (5 stops).
Paris P.-L.-M.-Montargis	126	78.3	9.05 p. m.	1.44	72.7	45.1	
Do. -Moret-Montargis	118	73.3	4.45 p. m.	1.34	75.3	46.8	
Do. -Melun	45	28.0	8.33 a. m.	0.38	71.1	44.2	
Do. -Fontainebleau	60	37.3	8.25 a. m.	0.45	80 0	49.7	
Do. -Montereau	79	49.1	1.15 a. m.	1.02	76.4	47.4	
Do. -Corbeil-Montereau	95	59.0	10.05 p. m.	1.17	85.1	53.4	
Do. -Corbeil	33	20.5	5.35 p. m.	0.27	73.3	45.6	
Do. -Laroche	156	96.9	9.00 a. m.	1.44	90.0	55.9	Côte d'Az. Exp
Laroche-Dijon	159	98.8	10.50 a. m.	1.52	85.2	52.9	Do.
Dijon-Lyon	197	122.5	12.43 p. m.	2.14	88.2	54.8	Do.
Lyon-Valence	116	72.1	3.05 p. m.	1.18	89.2	55.9	Do.
Valence-Avignon	124	77.0	4.26 p. m.	1.19	94.2	58.6	Do.
Avignon-Marseilles	121	74.1	5.49 p. m.	1 27	83.4	51.8	Do.
P.-O.							
Paris Aust.-Bordeaux St-Jean	588	365.4	11.00 a. m.	6.15	94.1	58.5	Sud Express.
Paris Q. O.-Les Aubrais	119	73.9	12.45 p. m.	1.14	96.2	59.8	
Les Aubrais-St-Pre-des-Corps	112	69.6	12.25 p. m.	1.07	100.3	62.2	Sud Express.
St-Pierre-des-Corps-Poitiers	101	62.7	1.37 p. m.	1.01	99.5	61.8	Do.
Poitiers-Angoulème	113	70.2	R 6.39 p. m.	1.09	98.2	61.0	
Angoulème-Bordeaux	139	86.3	3.50 p. m.	1.25	98.1	60.9	Sud Express.
Paris-Nantes	431	267.8	5.15 p. m.	4.51	88.9	55.3	4 stops.
Paris-Nantes-Le Croisic	524	325.6	5.15 p. m.	6.58	75.2	46.7	13 stops.
St-Pierre-des-Corps-Saumur	65	40.4	8.02 p. m.	0.39	98.8	61.4	
Saumur-Angers	44	27.3	R 7.40 p. m.	0.28	94.1	58 4	
Angers-Nantes	87	54.0	9.13 p. m.	0.53	98.5	61.2	

TABLE 102 (*Continued*).

COMPANY AND RUN.	Distance		Time of departure.	Time spent.	Speed		
	Km.	Miles.			Km./h.	Miles/h.	
Paris-Redon (Quimper)	446	277.1	3.30 p. m.	5.27	78.5	48.8	
Paris-Montauban-Toulouse	716	444.8	7.20 p. m.	9.34	74.8	46.5	
Paris-Vierzon	204	124.5	Do.	2.15	90.7	56.3	Summer.
Paris Q. O.-Aurillac	576	357.9	9.47 p. m.	8.18	69.4	43.1	
Vierzon-Châteauroux	63	39.1	9.43 p. m.	0.43	88.0	54.7	
MIDI.							
Bordeaux-Sète	426	264.7	7.28 a. m.	7.17	58.3	37.9	7 stops.
Bordeaux-Agen	136	84.5	7.28 a. m.	1.44	78.4	48.7	
Do. -Langon	43	26.7	8.00 p. m.	0.35	73.7	45.8	
Do. -Marmande	79	49.1	5.15 p. m.	1.01	77.7	48.2	
Carcassonne-Narbonne	59	36.7	6.28 a. m.	0.41	86.4	53.6	
Bordeaux-Dax	148	91.9	5.22 p. m.	1.37	91.5	56.8	Sud Express.
Bordeaux-Yehoux	76	47 2	12.31 a. m.	1.14	61.7	38 3	
Bordeaux-Arcachon	56	35.0	1.21 p. m.	0.48	70.0	43.5	
STATE.							
Paris-Dieppe	169	105.0	10.15 a. m.	2.26	69.4	43.1	
Paris-Havre	228	141.7	8.20 a. m.	2.24	95.0	59.0	
Paris-Rouen	140	86.1	Do.	1.23	101.2	62.8	
Rouen-Havre	88	54.7	9.46 a. m.	0.58	91.0	56.5	
Paris-Havre	228	141.7	4.35 a. m.	2.33	89.4	55.5	
Paris S. L.-Cherbourg	371	223.6	R 10.50 a. m.	5.04	73.2	45.5	5 stops.
Paris-Lisieux	191	118.7	R 7.04 a. m.	2.23	80.0	49 7	
Paris-Caen	239	148.5	R 12.50 p. m.	3.04	77.9	53.4	
Paris-Trouville-Deauville	221	137.3	7.15 p. m.	2.40	82.9	51.6	
	Do.	Do.	1.50 p. m.	2.00	110.5	68.7	Railcar.
Paris-Granville	328	203.8	11.20 a. m.	4.42	69.8	43.4	
Paris-Briouze	226	140.4	Do.	3.09	71.8	44.6	
Paris-Brest	624	394.0	3.30 p. m.	7.49	79.7	40.5	
Paris-Le Mans	211	131.1	Do.	2.25	87.3	54.3	6 runs.
Le Mans-Rennes	163	101.3	6.02 p. m.	1.50	88.9	55.3	
Rennes-Saint-Brieuc	102	63.3	7.59 p. m.	1.14	82.7	51 4	
Rennes-Dol (St-Malo)	59	36.7	8.04 p. m.	0.41	86.3	55 3	
(Paris) Le Mans-Sablé	48	29.8	11.47 a. m.	0.33	87.3	54.3	
Sablé-Angers	49	30.4	12.22 p. m.	0.35	84.0	52.2	
Paris-Bordeaux St. J.	615	388.3	9.15 a. m.	9.44	63.2	39.2	
Paris-Saumur (Orl.)	286	177.7	12.10 p. m.	3.30	81.7	50.7	4 runs.
Saumur-Thouars	40	24.9	R 2.37 p. m.	0.28	85.7	53.2	
Niort-Saintes	74	46.0	R 12.17 p. m.	0.49	90.6	56.3	
Saintes-Bordeaux St. J.	126	78.3	R 12.37 p. m.	1.33	81.3	50.5	
(Paris) Niort-La Rochelle	68	42.3	5.38 p. m	0.51	80.3	49.9	
Saintes-La Rochelle	74	46.0	1.42 p. m.	0.55	80.7	50.1	
La Roche-La Rochelle	102	63.3	12.24 p. m.	1.18	78.5	48.8	

continues slightly downhill all the way to Abbeville, after which there is a section more or less on the level (gradients of 1 in 500) as far as Etaples. The line then goes inland a little and crosses two small ridges between Etaples and Boulogne and between Boulogne and Calais, with gradients of 1 in 143 in one case, and 1 in 125 in the other.

The economic crisis has been more heavily felt on the Calais line than on the Brussels line. Nonetheless, every day there are eight rapides (fast expresses) in each direction, one of which covers the distance between Paris and Calais Harbour in 3 h. 5 m. in spite of a stop at Etaples; two others take 3 h. 10 m. non-stop, and one other does the journey in 3 h. 29 m. There are, in addition, two Paris-Boulogne rapides, which take 2 h. 43 m. without stop, and two others, taking 2 h. 34 m. and 2 h. 37 m. respectively, which stop at Etaples (1).

The Arras and Lille line, which branches off the Calais line at Amiens, is equally good technically. After a climb for 50 km. (31 miles), with gradients of 1 in 1 000, 500 and 200 as far as Achiet, the run down to Douai is over similar gradients and is followed by a section more or less on the level as far as Lille, except at the very end (where in each direction there are down gradients of 1 in 200).

There are no non-stop trains between Paris and Lille, but the 251 km. (156 miles) between the two towns are covered in 2 h. 40 m. with two 2-minute stops at Arras and Douai, so that the overall speed is even so 90.4 km. (56.1 miles) an hour.

It appears likely that the Paris-Lille non-stop run will be effected by the new express railcars which have been ordered by the *Nord* Railway Company.

The conditions on the line to Belgium are as good as those on the Calais line fig. 59). After the common section between Paris and Creil, there is a continuous climb with progressively increasing gradients, from 1 in 1 000 up to Compiègne, 1 in 1 000 to 1 in 333 up to Saint-Quentin, 1 in 250 to 1 in 200 until Busigny is reached. We have here the classic parabola of the watersheds, but with sufficient softness to please the operating department. From Busigny to Aulnoye there is an easy descent, after which there is a slight climb with the same technical conditions. Then comes the almost inappreciable descent to Charleroi (gradients of 1 in 333 to 1 in 1 000) and Liége (fig. 59).

The line to Brussels is different, however. The frontier is crossed at the same level as Aulnoye, after which there is immediately 16 km. (10 miles) downhill to Mons, which begins with a gradient of 1 in 111, increases to 1 in 100 and then still more to 1 in 80.

Under these conditions, the speed of the trains is necessarily slower the other side of the frontier on the *Nord-Belge* and *Belgian National* Railways.

There are six rapides from Paris to Saint-Quentin or back, two of which cover the distance in 88 minutes, two in 92, and two in 95 minutes, in spite of a 2-minute stop at Compiègne.

Two other trains run non-stop as far as Aulnoye in 126 minutes, while four non-stop rapides between Paris and Brussels and as many between Paris and Liége, pass through Aulnoye in three minutes less and cross the frontier at full speed.

(1) On the return journey, two rapides run non-stop from Calais to Paris in 3 h. 10 m., and a third, which stops at Etaples, takes 3 h. 16 m.; two other trains run from Boulogne to Paris in 2 h. 42 m., one of these trains stopping at Etaples.

It is therefore desirable, contrary to our usual practice, to mention the speed of these trains as well. But as the next section of line which is in Belgium belongs to the Belgian subsidiary company of the *Nord* Railway and as the locomotives go even further than this, we must also quote the whole journey from leaving Paris as far as running through (without stopping) Mons (on the Brussels line) and Charleroi (on the Liége line).

Jeumont (238 km. = 147.9 miles) at the end of the French section of the run is passed in 2 h. 14 m. at a speed of 106.5 km. (66.1 miles) an hour.

The trains for Brussels cover the French part of the run (233 km. = 144.8 miles) in 2 h. 27 m. on the outward and 2 h. 24 m. on the return journey, i. e. at 97.1 km. (60.3 miles) an hour.

All the heavy rapides are hauled by compound superheated *Superpacifics* with a boiler pressure of 17 hpz. (254 lb. per sq. inch), with driving wheels 1.90 m. (6 ft. 2 25/32 in.) in diameter. Their theoretical tractive power when working compound is 17 160 kgr. (37 830 lb.). In working order they weigh 100 t. (98.1 Engl. tons).

For some time, certain trains which have been reduced in weight have been hauled by the old *Atlantics*. Both types of locomotive are fitted with large tenders weighing 77 t. (75.8 Engl. tons) in working order, with 36 to 37 m^3 (7 920 to 8 140 Imp. gallons) of water and 9 tons of coal.

b) The two cross-country lines of the *Nord* and *Est* Systems are interesting. At the beginning a section of the « Nord Express » in competition with the Ostend line, only went from Calais to Jeumont (*Nord*). In this way it got to Liége in a shorter time than by the London-Ostend route. But this service has since been abandoned, and this section now links up at Brussels with the « Nord Express » from Ostend.

When the Tilbury-Dunkirk line was established to divert traffic coming from Alsace, which up to that time had gone to England via Metz, Luxembourg, Brussels and Ostend, it was completed by fast services between Dunkirk, Strasbourg and Basle with a branch to Nancy. At the present time the maritime service starts from Folkstone and the corresponding continental trains have been slowed down.

It appears likely that, in 1935 at the latest, a service of ferry boats between Dover and Dunkirk will replace the present mail boats, and will be used not only for goods transport but also to carry sleeping cars belonging to the *International Sleeping Car Co.*, in order to provide a new night service between Paris and London.

The intermediate cross-country line between Rheims, Laon, and Chaumont is always served by fast expresses, as the services between Calais and Basle and Switzerland can be carried out faster by avoiding the detour through Paris, since apart from saving the section over the congested lines and running into and out of two terminal stations, 93 km. (58 miles) are also saved to Châlons-sur-Marne (1) and 48 km. (30 miles) to Chaumont (2). Fast expresses run over this route at the same speed as those on the two radiating lines which it connects.

A concrete example will give a better idea of the time that can be saved by using this cross-country line : that of the « Orient Express » which runs through Paris during the Winter season and uses

(1) 217 km. (135 miles) instead of 310 km. (193 miles) via Paris Nord and Est.

(2) 351 km. (218 miles) instead of 399 km. (248 miles) via Paris Nord and Est.

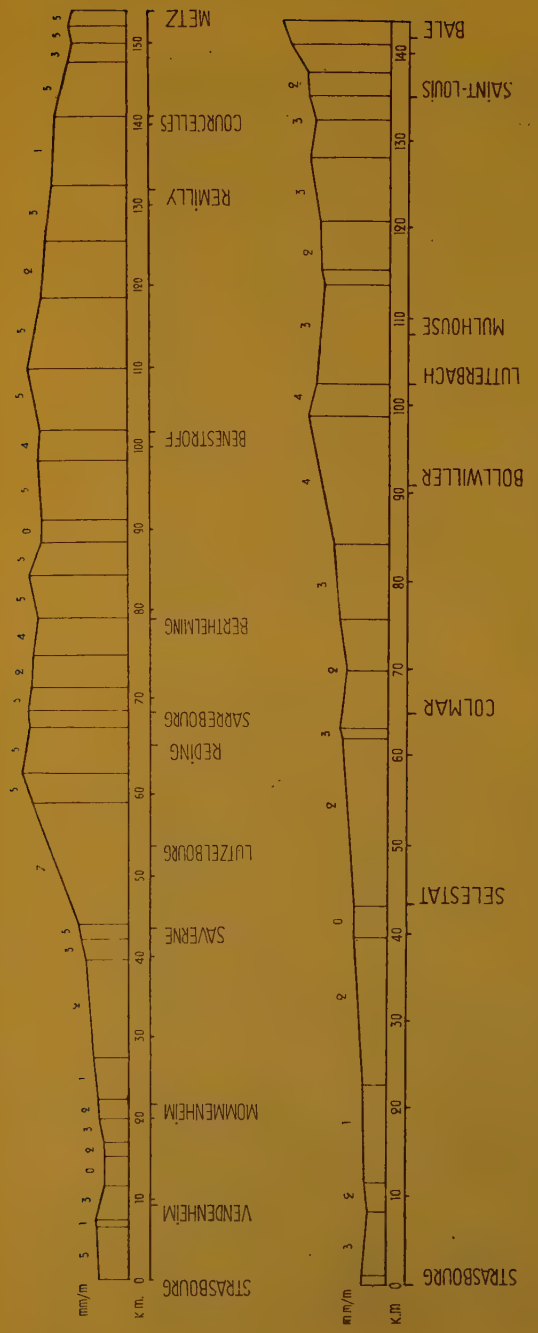


Fig. 60. — Gradients of the Strasbourg-Metz and Strasbourg-Basle lines. Alsace-Lorraine Railways.

the cross-country line after July 1st every year. It takes 6 h. 40 m. from Châlons-sur-Marne to Calais via Paris Est and Paris Nord (1) and 4 h. 45 m. via Laon, thus saving nearly two hours.

The Est System is in many respects like the *Nord*, and has some lines which are very suitable for high-speed working. This is due to the fact that it was possible to build them with long stretches on the level and with easy gradients rarely exceeding 1 in 200. For this it was necessary to drive many tunnels, none of them, however, being very long :

On the Strasbourg line, the Foug tunnel, 1 122 m. (3 681 feet) long (2).

On the Paris-Mulhouse route, the Culmont tunnel, 1 325 m. (4 347 feet) long (3).

Between Epernay and Rheims, the Rilly-la-Montagne tunnel, 3 441 m. (11 290 feet) long (4).

Between Rheims and Metz, the Tavannes tunnel, 1 190 m. (3 986 feet) long (5).

On this system, however, the number of runs at very high speeds will be found to have decreased in comparison with the 1932 Summer. This is due to the fact that, in many cases, two trains have been merged into one, or because one or several additional stops have been added to last year's timings.

In Alsace-Lorraine, the increase in speed has been so considerable during the last few years that this Company now holds the speed record for France.

The conditions of the Rhine Valley line are exceptionally favourable technically (fig. 60). Practically the whole line from Basle to Strasbourg is on a slight down

(1) This train arrives at Paris Est at 10.45 a.m. and leaves Paris Nord for Calais at 12.10 p.m.

(2) At the 303rd km. post. — (3) At the 310th km. post. — (4) At the 156th km. post. — (5) At the 283rd km. post.

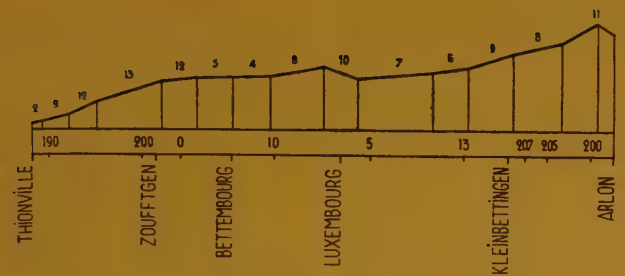


Fig. 61. — Gradients between Thionville, Luxembourg and Arlon. This line is worked, as far as Kleinbettingen, by the Alsace-Lorraine Railways.

gradient, with a few short sections where the down gradients are from 1 in 143 to 1 in 200, but more generally they are only 1 in 333, 1 in 500 and 1 in 1 000. The « Edelweiss » has the highest overall speed found in France, between Mulhouse and Strasbourg. This very light train consists of three to five coaches only.

Beyond Strasbourg, the line, which crosses the Vosges at the Saverne pass, is not so good as far as Metz, so that the fact that an overall speed of over 100 km. (62 miles) an hour is maintained is the more deserving. It rises as far as Hommarting from 469 to 879 feet, in 63 km. (39 miles), including near the summit a tunnel 2 676 m. (8 779 feet) long, then descends practically continuously as far as Metz (maximum gradients 1 in 200 in both directions) and Thionville (down gradients of 1 in 500 only). After that (fig. 61) the characteristics are more difficult. A climb of 1 in 77 to Zoufftgen is followed by a downhill run to Arlon with gradients of 1 in 90 to 1 in 143. After passing Thionville, it is no longer possible to maintain the previous speeds and this difficult situation continues as far as Brussels through the Ardennes.

The Paris - Lyons - Mediterranean *(P.-L.-M.)* System also has particular features which affect the speed of its trains. The grear artery from Paris to Nice and Ventimiglia has, over a length of 315 km. (196 miles) between Paris and Dijon, the longest common trunk line section in Europe, and then divides up into 5 radiating lines :

a)	Dijon-Ventimiglia:	808 km. (502	miles) ;
b)	Do. -Belfort:	188 km. (117.2	miles) ;
c)	Do. -Vallorbe:	148 km. (92	miles) ;
d)	Do. -Geneva:	289 km. (180	miles) ;
e)	Do -Modane:	358 km. (222	miles).

There are steep gradients on all these lines, and often long tunnels as well.

Between Paris and Ventimiglia there are gradients of 1 in 125 which have not been exceeded thanks to long tunnels :

The Blaisy tunnel (4 100 m. = 13 449 feet) between Baumes-Alesia and Dijon;

The Sainte-Irénée tunnel (2 110 m. = 6 924 feet) between Mâcon and Lyons;

The Nerthe tunnel (4 630 m. = 15 189 feet) between Avignon and Marseilles;

The Cassis tunnel (2 625 m. = 8 613 feet) between Marseilles and Toulon,

and by running the line between Toulon and Fréjus, along the Gonfaron pass.

On the Dijon-Vallorbe section, the gradients are 1 in 50 between Mouchard and Frasne.

The Dijon-Geneva line runs round the southern end of the Jura, passing through

Bourg and Bellegarde, which is a considerable way about, but even so does not make it possible to avoid having gradients of 1 in 125, 100 and 83, when running through the Bresse hills. True, there is a more direct line from Bourg to Bellegarde via La Cluse, which is 65 km. (40 miles) long, instead of 115 km. (71 miles), but this line is not suitable for high speeds. The construction of a by-pass line between Lons-le-Saulnier and Geneva, through the Faucille, is under consideration; it will reduce the length of the journey from Paris to Geneva by 67 km. (42 miles).

As for the Dijon-Bardonèche line towards Modane, it is uphill practically all the time as far as the Fréjus tunnel, the steepest gradients being 1 in 33.

All this influences the drawing up of the timetables which provide for a series of express trains over all these routes. They cannot be run at much less than 10-minute intervals in order to maintain sufficient headway between them; thus ordinarily 18 rapides or expresses leave Paris for Dijon between 7.30 p.m. and 11 p.m. The day before important holidays, the duplicates increase this number to 30 within the same period.

The weight of the express trains is frequently as much as 600 t. (590 Engl. tons). On the main line the locomotives are changed at Laroche-Migennes, Dijon, Lyons and Marseilles.

The Paris-Orleans is still under transformation as its electrification programme is not yet completed. It has just been extended as far as Tours, so that probably the timetables will be rearranged, which will put the *Paris-Orleans* among the high-speed Systems. Until then it easily maintains its place among those Companies whose express trains are noteworthy.

The « Sud Express » is now a Pullman train weighing 232 to 292 t. (228 to 287 Engl. tons) and covers the distance between Paris and Bordeaux in 6 h. 15 m., with 4 intermediate stops. The steam locomotives which haul it weigh 177 t. (174 Engl. tons), and the electric locomotives 131.7 t. (129.6 Engl. tons).

The other fast expresses, whose usual weight is 475 t. (467.5 Engl. tons) often increased to 720 (709 Engl. tons), are hauled by the same locomotives which have considerable reserves of speed. This was the result of converting the compound *Pacifics* of the 3700 class (in May 1932) into compounds with large sectional area steam passage, high superheat, and poppet valve gear. At high powers, an increase of 50 % has been noted.

On leaving Paris, the route is spoiled by the section between the Quai d'Orsay and Austerlitz stations, which is 3.748 km. (2.4 miles) long, over which the speed is limited to 35 km. (22 miles) an hour.

The fast express trains Nos. 15 and 8 are hauled by one locomotive over the 460 km. (285 miles) between Les Aubrais and Bordeaux. This run is effected with the usual load without taking water.

The State Railways offer a still more striking example, since for many years they lagged behind the other French railways and now suddenly have taken their place at the head thanks to the speed reached by their railcar.

The fast line is that from Paris to Mantes, where it branches off to Rouen and to Lisieux-Caen, with another branch from Lisieux to Trouville-Deauville, in all 351 km. (218.1 miles) long.

There are two routes of equal length (97.8 km. = 57.7 miles) from Paris to Mantes. The route via Conflans ascends 14 m. (46 feet) and trains leaving Paris have to face rising gradients of as much as 1 in 143, and down gradients of 1 in

200. The route via Sartrouville which is run over by the fast express trains has rising gradients of 1 in 500 only and a few down gradients of 1 in 200 as far as Rouen. Consequently it is an ideal line for high-speed running.

Between Rouen (262 feet above sea level) and Havre, a ridge 142 m.(466 feet) high has to be climbed. The climb takes place over gradients of 1 in 166 and the run down to Havre ends by 12 km. (7 miles) downhill on a 1 in 120 gradient.

Three trains cover the distance between Paris and Rouen in 1 h. 32 m., and two others in 1 h. 42 m. and 1 h. 43 m. respectively; a sixth train runs non-stop from Paris to Havre in 2 h. 33 m.

The Trouville-Deauville line was used for the trial runs of the first French express railcar. The usual trains over this line run at a very modest speed.

The trains between Paris and Rouen weigh from 450 to 460 t. (443 to 453 Engl. tons); the weight of the 241 000 class locomotives is 107 t. (105.3 Engl. tons) including the tender.

Most of the important lines of the *State* have gradients of as much as — but not exceeding — 1 in 100. Steeper gradients are found on the other lines, most of which have frequent alternating up and down gradients with no long climbs, not even easy ones.

Thus the line between Paris and Cherbourg has gradients of 1 in 125, and 1 in 111, between Mantes and Lisieux. It is, however, run over non-stop from Paris to Caen by some rapides and the Bugatti railcar (during its high-speed run from Paris to Deauville). Between Lisieux and Caen there are gradients of 1 in 100.

The Paris Montparnasse-Granville line is up and down all the way.

The Brest line is easy as far as Brest,

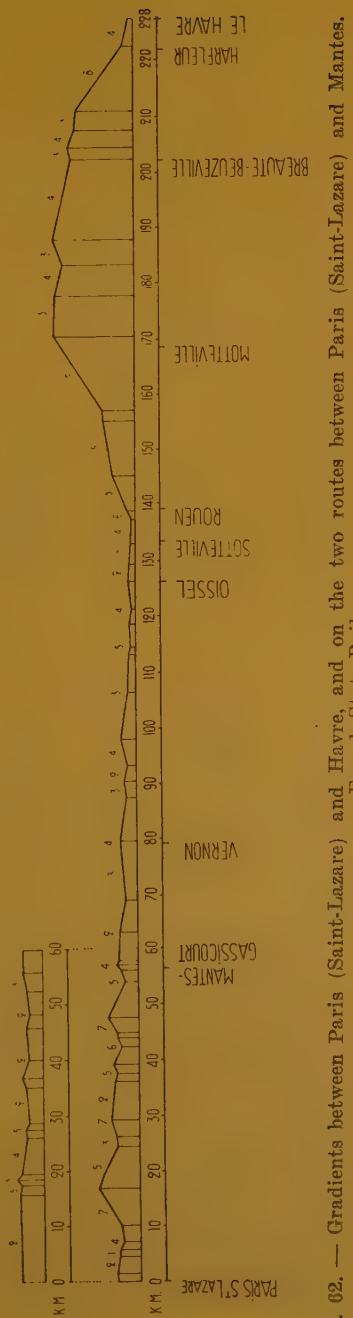


Fig. 62. — Gradients between Paris (Saint-Lazare) and Havre, and on the two routes between Paris (Saint-Lazare) and Mantes. French State Railways.

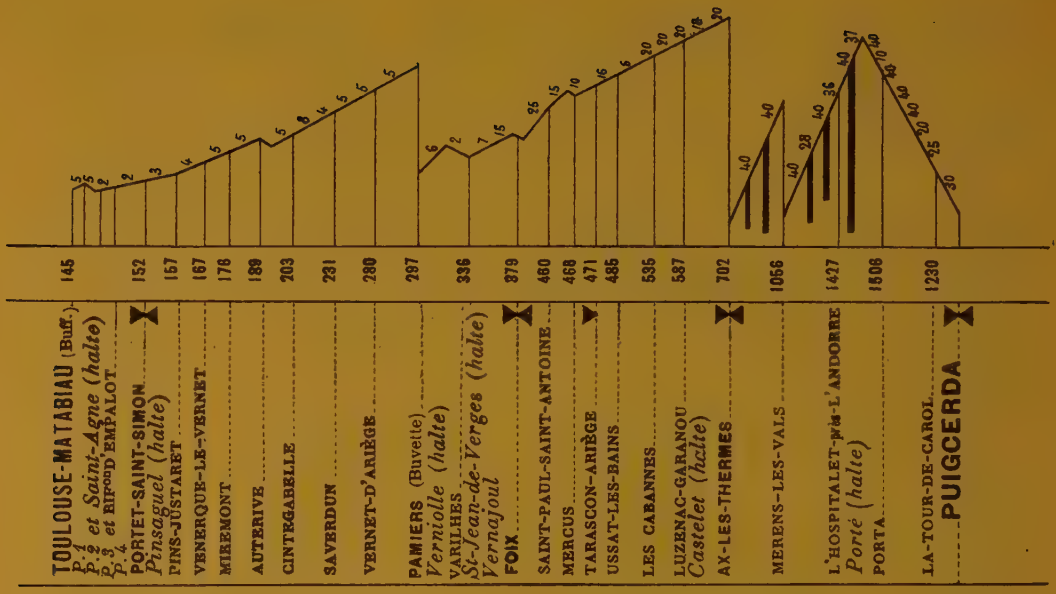


Fig. 63. — Gradients of the Toulouse-Puigcerda line.
Midi Railways.

the maximum gradients being 1 in 166; but beyond Brest there are constant gradients of 1 in 100.

The same conditions prevail on the Paris-Bordeaux line; between Saumur and Thouars there are gradients of 1 in 90 and 1 in 85. However, the total differences in level are not great.

The cross line from Nantes to Saintes has no gradients steeper than 1 in 100. There are, however, on some important lines, such as those from Chartres to Rouen or Caen to Laval, gradients of 1 in 66 and 1 in 62.

The main line of the Midi Railway is that from Bordeaux to Sète, which it was possible to locate north of the Pyrenees without any difficult gradients.

The main lines from Paris to Spain, however, are joint lines common to the *Paris-Orleans* and *Midi*, which latter prolongs them through the Pyrenees. The two outer lines avoid the mountain range by following the coast, while the intermediate lines, built at a later date, have only within recent years run right through the mountain.

The Bordeaux-Dax line is on the level the whole way. Beyond Dax it has the drawbacks inherent in coastal lines all the way to the Spanish frontier.

The two outer lines, coming from Paris, are run over by « de luxe » trains : the « Barcelone Express » on the East; the « Pyrénées-Côte d'Argent » and the « Sud Express » on the West. This latter train alone has been timed at high speed. After its first acceleration, owing to an unfortunate accident, it had to be slowed down, but gradually it has again

been brought up to a good speed. This train weighs 268 t. (263.8 Engl. tons) and is hauled by class E 3101 electric locomotives weighing 105 t. (103.3 Engl. tons).

From May 1927 to May 1930 the « Sud Express » ran over the electrified section of line from Bordeaux to Bayonne at speeds of from 95 to 110 km. (59 to 68.3 miles) an hour. In particular it covered the distance from Bordeaux to Dax (147.5 km. = 91.7 miles) in 1 h. 29 m., i. e. at a speed of 99.4 km. (61.7 miles) an hour, and the return journey in 1 h. 27 m., i. e. at 101.7 km. (63.2 miles) an hour.

The journey from Bayonne to Bordeaux (197.6 km. = 122.8 miles) was run in 2 h. 2 m., i. e. at a speed of 97.2 km. (60.2 miles) an hour, but the speed of these trains was lowered at the request of the Authorities.

Since that time, the new 2 000-H.P. electric locomotives have enabled the « Sud Express » to save 23 minutes between Paris and Biarritz and this run will be still further accelerated.

The central Trans-Pyrenean lines are mountain lines which were inaugurated in 1928 and 1929 respectively. As electric traction has been resorted to, more difficult technical conditions were permissible than on the routes through the Alps which are worked with steam traction. With curves of a minimum radius of 200 m. (10 chains), they have gradients exceeding 1 in 25.

The Bedous to Canfranc line [1] which joins Pau to Saragossa via the Aspe and Aragon valleys, passing under the Somport pass, has gradients of 1 in 28 as far as Etsant and 1 in 23 after that. The international station at Canfranc lies at the mouth of the summit tunnel which is 7 875 m. (25 836 feet) long, 3 160 m. (10 368 feet) being in France.

The line from Ax-les-Thermes to Puigcerda connects Toulouse to Barcelone via the Haute-Ariège and the Carol valleys, being carried under the Puymorens pass. It rises from a height of 700 m. (2 297 feet) above sea level at Ax-les-Thermes, to 1 567 m. (5 141 feet) in the summit tunnel, through 11 tunnels, all on the French side of the frontier and including the helicoidal tunnel at Saillens (1 150 m. = 3 773 feet) and the Puymorens tunnel between L'Hospitalet and the Porté halt, which is 5 333 m. (17 497 feet) long. The line is then downhill as far as the international stations at La Tour de Carol (1 231 m. = 4 308 feet above sea level) and Puigcerda (1 115 m. = 3 658 feet above sea level), which are situated one on each side of the frontier [2] (fig. 63).

XVI-3. — **The fastest trains.** — Table 103 does not require any commentary, unless for drawing attention to the fact that wherever Pullman trains are run, it is these trains that make the fastest runs, with the single exception of some sections on the *Paris-Orleans* main line.

The runs on the electrified lines from Paris Austerlitz to Tours and to Vierzon (*Paris-Orleans*) and from Bordeaux to Hendaye (*Midi*) are also interesting.

---

(1) Bedous is at an altitude of 400 m. (1 311 feet) and the highest point in the long tunnel between « Les Forges d'Abel » (1 067 m. = 3 501 feet above s. l.) and the international station at Canfranc (1 155 m. to 1 211 m. (3 789 feet above s. l.), i. e. at 771 m. (2 529 feet) below the summit. After that the line descends continuously for 24 km. (15 miles) as far as Jaca which is 827 m. (2 713 feet) above sea level.

(2) We might add that the line from Cerdagne de Villefranche to La Tour de Carol crosses the Pyrenees at the Perche pass, 1 584 m. (5 197 feet) above sea level, in order to pass from the Tèt valley to that of the Sègre, but this is only a metre-gauge line.

TABLE 103.

FASTEST TRAINS OF THE FRENCH RAILWAYS (1933 Summer).

COMPANY AND RUN.	Distance. Km.	Distance. Miles.	Time of departure.	Time spent.	Speed. Km./h.	Speed. Miles/h.	
ALSACE-LORRAINE.							
(Basle) Mulhouse-Strasbourg . .	109	67.7	9.44 a. m.	1.01	107.2	66.6	Edelweiss.
Strasbourg-Metz (Brussels) . . .	159	98.8	10.50 a. m.	1.32	103.7	65.5	Do.
Metz-Thionville	30	18.6	12.24 p. m.	0.20	90.0	55.9	
NORD.							
Paris N.-Aulnoye Frontier (1) . .							Etoile du Nord
Do. do. do. (2) . .							Nord Express.
Paris N.-St-Quentin (Brussels). .	154	95.7	1.36 p. m.	1.28	105.0	65.2	
Do. -Arras (Lille)	199	123.6	8.15 a. m.	1.54	104.7	65.0	
Do. -Aulnoye (Brussels) . .	216	134.2	8.00 p. m	2.06	102.8	63.8	
Do. -Etaples (Calais) . . .	227	141.1	10.00 a. m.	2.13	102.4	63.6	
Do. -Boulogne Town	254	157.8	4.40 p. m.	2.34	98.9	61.4	
STATE.							
Paris St. Laz.-Trouville-Deauville.	221	137 3	1.50 p. m.	2.00	110.5	68.7	Railcar.
Do. -Rouen (Havre) . .	140	87.0	8.30 a. m.	1.23	101.2	67.6	
(Paris Mp.) Niort-Saintes (Bord.)	74	46.0	R 12.17 p. m.	0.49	90.6	56 3	
EST.							
Paris Est-Bar-le-Duc (Nancy) . .	254	157.8	R 10.10 a. m.	2.30	101.6	63.1	
Do. -Bar-le-Duc-Nancy . . .	99	61.5	R 9.09 a. m.	0.59	100.7	62.5	
Do. -Troyes (Belfort) . . .	157	103.7	12.07 p. m.	1.43	96.8	60.1	
(Paris E.) Troyes-Chaumont (Belfort)	95	59.0	R 11.05 a. m.	0.58	98.2	61.0	
Chaumont-Belfort	181	112.5	1.50 a. m.	1.55	94.4	58.6	
PARIS-ORLEANS.							
(Paris) Les Aubrais-St. P. des C.	112	69.6	12.25 p m.	1.07	100.3	62.2	Sud Expr. (2).
(Paris) Angers-Nantes	87	54.0	9.13 p. m.	0.53	98.5	61.2	
(Do.) Poitiers-Angoul. (Bord.) .	113	70.2	R 6.39 p. m.	1.09	98.2	61.0	Do.
(Do.) Angoulème-Bordeaux . .	139	86.3	3.50 p. m.	1.25	98.1	60.9	
(Do.) St. P. des C.-Poitiers (do.).	98	60.9	1.37 p. m.	1.01	96.4	59.9	
(Do.) Tours-Saumur (Nantes) .	62	38.5	8.02 p. m.	0.39	95.4	59.2	
Paris-Vierzon (Montauban). .	204	126.8	7.20 p. m.	2.15	90.7	56.3	(3).
P.-L.-M. (1933/34 Winter).							
(Paris P.-L.-M.) Valence-Avignon (Marseilles)	124	77.0	4.26 p. m.	1.19	94.2	58.5	Côte d'Azur.
Paris P.-L.-M.-Laroche (Marseilles)	156	39.1	9.00 a. m.	1.44	90.0	55.9	Do.
MIDI.							
Bordeaux St. J.-Dax (Hendaye). .	148	91.9	5.22 p. m.	1.37	91.5	56.8	Sud Expr. (3).

(1) Runs through to Brussels (without stoppage at the frontier).
(2) Runs through to Liége (without stoppage at the frontier).
(3) Electric traction.

Fig. 64. — Cartogram of train speeds of non-stop runs from Paris.
(See legend, fig. 7, p. 1028/46 of the November, 1933, *Bulletin*.

On the *Nord* System the longest non-stop runs today are from Paris to Belgian towns : Liége and Brussels, and are made by two trains in each direction to each of these places.

It is curious to note also that though the non-stop trains from Paris to Calais take 3 h. 10 m. for the journey, the rapide which stops for two minutes at Etaples is timed at only 3 h. 5 m., thus showing how easily ten minutes could be saved on the non-stop run, which could be made in exactly three hours.

The P.L.M. Railway was one of the last French systems to speed up its trains. It began by rebuilding one of its *Pacifics* according to the practice of the *Paris-Orleans* and as the trials were completely successful (1), it is proceeding, starting with the timetable for the 1933/34 Winter, to put these results into practical

(1) With a train weighing 423 t. (416.3 Engl. tons), the three stages Paris-Laroche, Laroche-Dijon, and Dijon-Lyons were made in 299 minutes.

Table 104.

LONGEST NON-STOP RUNS OF THE FRENCH RAILWAYS.

(August 1933.)

COMPANY AND RUN.	Distance		Time of departure.	Time spent.	Speed		
	Km.	Miles.			Km./h.	Miles/h.	
NORD.							
Paris N.-Liége Guill.	367	229.9	10.10 a. m.	3 50	95.7	59.4	Nord Express.
Do. -Brussels Midi	311	193.2	11.25 a. m.	3.15	95.7	59.4	Etoile du Nord
Do. -Calais Mar.	299	185.8	12.00 noon	3.10(1)	94.4	58.6	Golden Arrow.
Do. -Boulogne Ville	254	157.8	4.40 p. m.	2.34	98.9	61.5	Boat train.
(Calais) Etaples-Laon (Rheims).	204	126.8	6.11 p. m.	2 13	92.0	57.2	Do. Transverse line
EST.							
Paris E.-Nancy	353	219.4	5.46 p. m.	3.51	91.7	56.9	
Do. -Troyes-Belfort	276	171.5	8.51 a. m.	3.04	90.0	55.9	
Paris E.-Chaumont (Belfort)	262	162.8	R 6.26	2.59	87.7	54.5	
Do.	*Do.*	*Do.*	*R 9.12* p. m.	*2.43*	*96.4*	*59 9*	
Do. -Bar-le-Duc (Nancy)	254	157.8	R 10.10 a. m.	2.30	101.6	63 1	
(Calais) Laon-Chaumont.	243	151.0	8.34 p. m.	2.46	87.8	54 6	Boat train. Transverse line.
Paris E.-Bar-sur-Aube (Belfort)	221	137.3	10.50 p. m.	2.38	83.9	52.2	
Do. -Troyes-Vesoul (do.)	214	133.0	R 4.23 p. m.	2.18	93 0	57.8	Winter.
STATE.							
Paris Mp.-Thouars (Bordeaux).	326	201.3	*R 2.03* p. m.	*4.15*	*76.7*	*47.6*	
Do. -Saumur Or. (Bordeaux).	286	177.7	12.10 p. m.	3.30	81.7	50.7	
Paris St. Laz.-Caen (Cherbourg).	239	148.5	R 12.50 p. m	3.04	77.9	53.4	
Paris Mp.-Briouze (Granville).	226	140.4	11.20 a. m.	3.09	71.8	44.6	
Paris St. Laz.-Havre	228		4.35 p. m.	2.33(1)			
Paris St. Laz.-Trouville-Deauville.	221	137.3	7.15 p. m.	2.40	82.9	51.6	Locom.-hauled.
Do.	Do.	Do.	1.50 p. m.	2.00	110.5	68.7	Railcar.
Paris Mp.-Le Mans (Brest).	211	131.1	3.30 p. m.	2.25	87.3	54 3	
ALSACE-LORRAINE.							
Strasbourg-Metz (Luxembourg)	159	98.8	10.50 a. m.	1.32	103.7	64.4	Edelweiss.
PARIS-ORLEANS.							
Paris Q. O.-Vierzon (Montauban).	204	126.8	7.20 p m.	2 15	90.7	60.1	(2).
MIDI.							
Bordeaux S. J.-Dax (Hendaye)	148	92.0	5.22 p. m.	1.37	91.5	56 8	Sud Expr. (2).
P.-L.-M.							
(Paris P.-L.-M.) Dijon-Bellegarde.	257	159.7	12.18 a. m.	4.15	59.9	37.3	
(Do.) do. -Lyons.	197	122.5	12.43 p. m.	2.14	88.2	54.8	Côte d'Az. Rap.

(1) Some other trains, making intermediate stops, are faster. — (2) Electric traction.

working by applying them first of all to the « Côte d'Azur Rapide » which saves three quarters of an hour on its Paris-Marseilles run and 55 minutes up to Nice.

Paris is served by a dozen lines, three of which are run over by trains whose average speed is over 100 km. (62 miles) an hour, three at over 90 km. (65 miles) approximately, and three others at over 80 (50 miles) approximately. The cartogram, figure 64, shows this graphically, and we have included in it, as in figure 65, all the towns which are connected to Paris by non-stop runs.

It may be remembered that the speed tests of the Garratt locomotive, before it was sent to Algiers, proved, if any proof where needed, that this type of articulated locomotive is perfectly suitable for high-speed working. In particular it hauled, between Laroche and Dijon, 26 express trains weighing up to 716 t. (704.7 Engl. tons) and reached a maximum speed of 125 km. (78 miles) an hour.

XVI-4. — **The longest non-stop runs** are shown in table 104. In certain cases these are also the fastest runs.

On the *Est*, the most notable run is that from Strasbourg to Paris, with a single intermediate stop at Nancy.

TABLE 105.

ACCELERATION OF THE « CÔTE D'AZUR RAPIDE ». (October 1933.)

RUN.	Distance		Time of departure.	Time spent.	Speed.	
	Km.	Miles.			Km./h.	Miles/h.
Paris-Nice	1028	638.8	8.15 a. m.	12.35	81.7	54.7
Paris-Marseilles	863	536.3	Do.	9.33	90.4	56.4
Paris-Laroche	156	96.9	8.15 a. m.	1.34	99.6	61.9
Laroche-Dijon	159	98.8	9.54 a. m.	1.41	94.4	58.6
Dijon-Valence	197	122.5	11.40 a. m.	2.00	98.5	61.2
Lyons-Valence	106	62.5	1.47 p. m.	1.15	84.8	52.7
Valence-Avignon	124	77.0	3.05 p. m.	1.15	99.2	61.6
Avignon-Marseilles	121	75.1	4.23 p. m.	1.25	85.4	53.0

The *State* Railways used to have a non-stop run from Paris Montparnasse to Thouars (326 km. = 201.3 miles). This was the longest non-stop run in France, and today it is only exceeded by that from Paris to Nancy. It has been somewhat reduced, as all the trains make their first stop at Saumur (286 km. = 177.7 miles).

The *State* is the only French railway on which Ramsbottom troughs are used, four of these being installed on the System :

a) Between Chartres and Thouars, near Château du Loir, 218 km. (135.5 miles) from Montparnasse;

b) On the Brest line, at the 105th km. post (65.2nd mile) a little before Courville;

c) On the Cherbourg line, between Evreux and Arnières, at the 110th km. post (68.4th mile) from Saint-Lazare, where the boat trains pick up water while running;

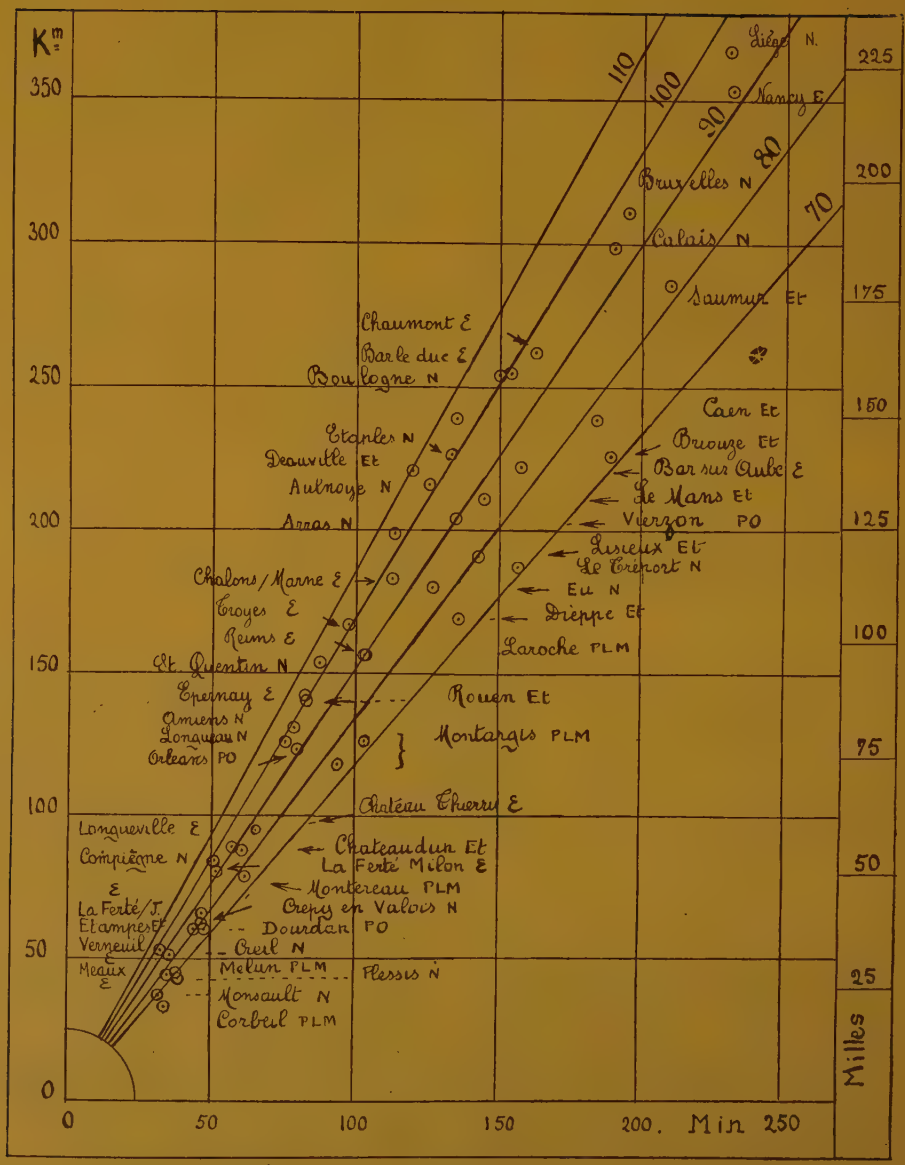


Fig. 65. — Chart of all places served by non-stop trains from Paris.
(See legend, fig. 7, p. 1028/46 of the November, 1933, *Bulletin*.)

Table 106.

DEVELOPMENT OF THE FRENCH MAIN LINES AND OVERALL SPEEDS

they are run over by the fastest trains.

Mileage worked in 1932.	Miles per hour.							RAILWAY.	Kilometres per hour.							Kilometrage worked in 1932.
	Over 62	59 to 62	56 to 58.9	50 to 55.9	44 to 49.9	38 to 43.9	Less than 38		Over 100	95 to 99.9	90 to 94.9	80 to 89.9	70 to 79.9	60 to 69.9	Less than 60	
2 380	301	45	131	375	63	58	1 407	Nord	485	73	210	603	101	94	2 264	3 830
3 117	219	157	218	213	253	260	1 797	Est	353	253	351	344	407	419	2 890	5 017
1 435	166	42	52	22	25	97	1 031	Alsace-Lorraine . .	267	67	84	35	40	155	1 662	2 310
6 161	...	396	7	277	594	511	4 376	P.-L.-M.	...	636	12	446	956	822	7 042	9 914
4 694	70	311	180	186	422	467	2 958	P.-O.	112	499	290	299	679	589	5 087	7 555
2 666	...	...	136	74	241	504	1 711	Midi	...	...	218	119	388	812	2 753	4 290
5 676	194	30	101	686	822	298	3 545	State	312	48	162	1 144	1 323	480	5 665	9 134
26 129	950	979	825	1 858	2 419	2 095	16 825	(*) Total. . .	1 529	1 576	1 327	2 990	3 894	3 371	27 363	42 050
100	3.63	3.75	3.15	7.11	9.26	8.02	65.08	Percentage for the whole of the lines.	3.63	3.75	3.15	7.11	9.26	8.02	65.08	100

(*) When converting kilometres into miles, we have increased the unit figure by one when the first decimal place was 5 or above. The result is that, when adding up the miles so obtained, we get totals not identical with those of the total kilometres converted into miles. We have nevertheless retained the figures obtained by direct conversion of these totals as being more accurate than the result of adding up the partial conversions rounded off to the nearest whole figure.

Table 107.

TRAIN-MILES (TRAIN-KILOMETRES) RUN AT VARIOUS AVERAGE SPEEDS.

The number of runs corresponding to the indicated train-miles and train-kilometres are shown in brackets.

Total mileage (1932).	Train-miles run at over					COMPANY.	Train-kilometres run at over					Total kilometrage (1932).
	64 miles/h.	62 miles/h.	60 miles/h.	58 miles/h.	55 miles/h.		103 km./h.	99.8 km./h.	96.6 km./h.	93.3 km./h.	88.5 km./h.	
						FRANCE.						
2 380	633 (5)	2 232 (17)	3 510 (32)	4 981 (51)	6 247 (72)	Nord.	1 044	3 592	5 649	8 016	10 053	3 830
3 117	...	219 (2)	469 (5)	1 411 (16)	3 648 (40)	Est.	...	352	755	2 271	5 871	5 017
1 435	135 (2)	231 (3)	421 (5)	558 (7)	1 306 (24)	A.-L.	217	372	678	898	2 102	2 310
6 161	...	...	...	77 (1)	540 (8)	P.-L.-M.	...	...	...	124	869	9 914
4 694	...	70 (1)	616 (10)	1 121 (18)	224 (34)	P.-O.	...	113	992	1 804	360	7 555
2 666	...	...	...	66 (1)	486 (7)	Midi.	...	...	...	106	782	4 290
5 676	272 (2)	446 (4)	446 (4)	446 (4)	1 298 (18)	State.	438	718	718	718	2 089	9 134
26 129	1 040 (9)	3 198 (27)	5 462 (56)	8 660 (98)	15 749 (203)	(*) Total.	1 673	5 147	8 790	13 937	25 345	42 050
						GREAT BRITAIN.						
6 947	153 (1)	286 (2)	783 (7)	2 007 (30)	8 693 (119)	L. M. S.	249	460	1 276	3 552	13 990	11 180
6 401	...	106 (1)	275 (5)	623 (16)	4 785 (78)	L. N. E.	...	171	443	105	7 501	10 301
3 801	77 (1)	184 (2)	1 307 (13)	2 347 (23)	5 723 (76)	G. W.	124	296	2 103	3 777	9 210	6 117
2 175	...	...	...	...	881 (11)	S.	...	...	...	...	1 448	3 500
19 324	230 (2)	576 (5)	2 375 (25)	5 209 (69)	20 336 (284)	(*) Total.	370	1 127	3 822	8 331	32 317	31 098

(*) See footnote, table 106.

TABLE 108.

MEAN OVERALL SPEEDS OF THE PRINCIPAL SERVICES BETWEEN VARIOUS TOWNS.

COMPANY.	TRAIN SERVICES BETWEEN	Distance		Number of services.	Average time spent.	Mean overall speed	
		Miles.	Km.			Miles/h.	Km /h.
	FRANCE.						
Nord.	Paris-Saint-Quentin.	95.1	153.9	10	1.35	59.8	96.2
	Do. -Brussels.	193.1	310.8	10	3.23	57.1	91.9
	Do. -Calais	184 6	297.1	6	3.12	57.5	92.5
	Do. -Arras	119.4	192.1	10	2.00	59.7	96.0
	Do. -Lille	156.0	251.1	9	2.47	56.0	90.1
Est.	Paris-Metz						
	Do. -Nancy	219.0	352.5	11	4.03	54.1	87.1
	Do. -Belfort	274.9	441.1	10	5.19	53.0	85.3
Est + A.-L.	Paris-Strasbourg	312.2	502.4	10	5.55	52.7	84.8
Als.-Lorr.	Metz-Basle						
	Do. -Mulhouse	163.9	263.8	14	3.05	53.0	85.0
P.-L.-M.	Paris-Lyons	318.0	511.9	10	6.30	48.9	78 2
	Do. -Marseilles	536.3	863.0	10	11.53	46.4	74.6
	Do. -Clermont-Ferrand . . .						
P.-O.	Paris-Bordeaux	362.0	582.6	10	7.00	52.1	83.9
	Do. -Nantes						
P.-O. + M.	Paris-Bayonne	484.7	780 1	8	9.56	48.8	78.5
	Do. -Toulouse						
State.	Paris-Bordeaux						
	Do. -Rennes						
	Do. -Cherbourg						
	Do. -Havre	141.5	227 7	8	2.39	53.3	85.8

MEAN OVERALL SPEEDS OF THE PRINCIPAL SERVICES BETWEEN LONDON AND THE VARIOUS TOWNS HEREAFTER.

	GREAT BRITAIN.						
G. W.	Birmingham	110.6	178 1	14	2.04	53.4	85 9
	Bristol	118.3	190.4	12	2.16	52.2	88.5
	Cardiff	145.3	233.8	13	2.56	49.5	79.7
	Exeter	173.5	280.3	11	3.10	54.8	88.2
	Plymouth	225.5	363.0	10	4.34	49.4	79.5
L. M. S.	Birmingham	112.9	181.7	15	2.03	54.9	88.4
	Nottingham	123.5	198.4	18	2.26	50.6	81.5
	Sheffield	158.5	255.1	17	3.17	48.1	77.4
	Manchester	188.6	303.9	12	3.38	51.8	83.4
	Liverpool	193.7	311.8	12	3 42	52.2	84.0
	Glasgow.	401.4	645.5	6	8.12	49.0	78.9
	Perth.	449.9	724.0	7	9.59	45.1	72.6
L. N. E.	Sheffield	164.7	265.1	14	3.20	49.4	79.5
	Leeds.	185.7	298.9	16	3.43	50.0	80.5
	Newcastle	268.3	431.8	14	5.22	50.0	80 5
	Edinburgh	392.7	632.0	10	8.00	49.1	79.1
	Perth.	440.4	708.7	10	9.52	44.6	71.8
	Aberdeen	523.2	842.0	6	11.42	44.7	71.9
Southern.	Bournemouth	107.9	173.6	12	2 13	48.7	78 3
	Exeter	171 7	276.3	10	3.34	48.1	77.4

d) Finally the most recent installation is that put down in 1929 on the Havre line, between Saint - Pierre - du - Vouvray and Léry-Poses, at the 110th km. (68.4th mile) from Saint-Lazare, which, in addition to the boat trains, was used last Summer by the only daily fast express which worked this run non-stop; this train was also noteworthy as being at the time the only French train from which coaches were slipped.

XVI-5. — **Conclusions.** — Although the fastest trains running over two thirds of the mileage of the French railway systems have an overall speed of less than 60 km. (37 miles) an hour, the proportion of the total mileage run over at high speed is noteworthy, as table 106 shows.

The distribution of this mileage over the various systems and lines is clearly shown on the speed cartogram (fig. 32) at the beginning of Chapter XIII.

TRAIN-KILOMETRES AT THE DIFFERENT AVERAGE SPEEDS. — Table 107 showing the train-kilometres run over at the various average speeds has been drawn up from information given in the *Journée Industrielle*, of Paris (1), *The Railway Magazine* (2) and *The Railway Gazette* (3), of London. It completes the preceding table, as if the former shows the lines of each system run over at given overall speeds, the latter deals particularly with the runs of the fastest trains on given lines.

AVERAGE SPEEDS BETWEEN TWO PLACES. — Since 1915, when our first study on train speeds appeared in *The Railway Gazette*, we have systematically maintained that for the travelling public the average speed of all the trains serving two places was more important than the overall speed of the best train among them. Consequently we were very pleased to see that the two important English periodicals which deal more particularly with these questions, *The Railway Gazette* (3) and *The Railway Magazine* (4) from whom we have borrowed much information — for which we are duly grateful — have published tables showing the average speeds of express trains between London on the one hand and Paris on the other, and a certain number of the large provincial centres.

It is this information, regrouped and shown in kilometres and miles, that we give in table 108.

Actually the French services should be completed by information about the express trains from Paris to Metz, Clermont - Ferrand, Toulouse, Bordeaux (*State*), Rennes and Cherbourg, but these trains are slower than those we mention and consequently are less interesting. We have named these towns, however, in order that they be not overlooked.

The most remarkable services are obviously those from Paris to Calais and Brussels (*Nord Railway*) and those from Paris to Bordeaux and Bayonne (*Paris-Orleans* and *Midi*) which are definitely faster than Anglo-Scottish trains running equal distances.

The 14 trains serving, at a speed of 85 km. (53 miles) an hour, provincial centres such as Metz and Mulhouse, should also be noted, although for the sake of completeness the whole journey from Luxembourg to Basle should be taken into consideration. These two towns, it is true, are beyond the frontier, but the same objection could also apply to the Paris-Brussels line.

Train frequency between London and the English provincial towns is higher than with the corresponding French serv-

(1) July 3rd, 1933.
(2) September and December, 1933.
(3) August 16th, and October 27th, 1933.
(4) November and December, 1933.

ices, even subtracting the surplus of services to such towns as Birmingham, Perth or Exeter, which are served by several Companies. It may be noted that in spite of the amalgamation, the departure times by the different routes have been left unchanged, so that the trains start in batches, just as when they were in competition, though they could have been better spaced over the day. In this way, one of the advantages of amalgamation made possible without additional expenditure has been lost.

On the other hand, the departure times of trains for the large provincial cities are better distributed in France than in England, where frequently, for equal distances, it is necessary to leave London three to six hours earlier than would be the case in Paris, in order to get to one's destination before nightfall.

Taking into consideration the twenty provincial services and the fifteen French services (which is not altogether fair as the services to towns less well served have been ommitted) it will be seen that :

in the case of distances of 100 to 200 miles (161 to 322 km.) there is in France an average of 9.6 services instead of 13.5 in Great Britain, but their overall speed is on the average 91.1 km. (56.6 miles) an hour instead of the 82.3 km. (51.1 miles) an hour in England;

and for distances of 200 to 500 miles (322 to 805 km.) there are 9.8 French services as compared with 9.5 English services, with overall speeds of 83.1 km. (51.6 miles) an hour instead of 77.1 km. (47.9 miles) an hour.

It will be seen therefore that if the French services are fewer in number they are faster than the corresponding English services.

There remains to deal briefly with the Anglo-French services from Paris (*Nord*) to London (*S. Ry.*) which we were not able to include in these tables and which are of equal interest to the two countries concerned. We mentioned previously (table 12, page 906/22) the fastest services by each of the routes connecting the two capitals, and we will add here additional information about the average time taken by all the services over the fast routes via Calais or Boulogne, since they were accelerated last October.

TABLE 109.

FRANCO-BRITISH SERVICES BETWEEN PARIS AND LONDON.
(*Nord* and *Southern Rys.* — October 1933.)

Time of departure.	SEA ROUTE via	Time spent.	Time of departure.	SEA ROUTE via	Time spent.
	PARIS TO LONDON.			LONDON TO PARIS.	
8.20	Dover	6 h. 50	9.00 a. m.	Folkestone	6 h. 50
10.30	Folkestone	6 h. 50	11.00 a. m.	Dover	6 h. 40
12.20 p.m.	Dover	6 h. 40	2.00 p. m.	Do.	6 h. 45
4.40 p.m.	Folkestone	6 h. 25	4.30 p. m.	Folkestone	6 h. 40
	Average time :	6 h. 41		Average time :	6 h. 44

General average time : 6 h. 42 1/2 m.

In all 2 h. 10 m. has been saved in comparison with last year's timetables, i. e. 16 1/2 minutes per journey, but what is much more interesting is the fact that there is now only a difference of 25 minutes, i. e. 6 % between the slowest and the fastest journey.

Five of the six rapides from Paris to Calais or Boulogne have an overall speed of 94.7 km. to 96 km. (58.1 to 59.7 miles) an hour; the sixth only runs at an overall speed of 88.8 km. (55.2 miles) an hour, while the four other rapides have between Paris and Etaples an overall speed of 96.9 to 102.7 km. (60.2 to 63.9 miles) an hour.

These fast journeys are, it is true, merely a return to the speeds of April 1914, when by leaving Charing Cross at 4.30 p. m. one arrived at Paris at 11.10, i. e. in 10 minutes less than the best service in the same direction at the present time (1).

(1) The train only took 1 h. 30 m. to get to Dover, and the boat left 5 minutes after its arrival.

(To be continued.)

[62 .(01 & 624. (0]

Non-destructive testing methods as applied to bridges. Use of radiography, (1)

by W. ROSTECK, Dipl.-Ing., Reichsbahnrat, Berlin.

(From *Glaser's Annalen*, 1933. vol. 113, No. 1354, pp. 89-92) (2).

Non-destructive testing methods now in use are commented upon and their possibilities are discussed. The Röntgen equipment of the Central Technical Office for construction and operation, of the Reichsbahn, is described with remarks on the testing *in situ* of constructional parts by X-rays.

Now that such rapid progress is being made in all branches of science, it becomes particularly important that the test instruments and methods employed ensure that, as regards safety, the physical properties of all *constructional materials* enable them to stand up to the increasingly severe requirements of present-day working conditions, especially in the case of continuous service.

This explains why a considerable number of testing appliances based on widely differing principles have recently appeared on the market. Any device which reveals and shows up, without destroying the part examined, internal defects hidden from the naked eye, is naturally to be preferred to any method of testing to destruction, provided of course that the non-destructive test methods do practically reveal defects beyond any possibility of doubt. When the only information an engineer has on the different types of test instruments is that given by the inventor or maker, he is the less able to make a satisfactory selection the less time he has to check the claims made.

The following remarks are intended primarily to shown how far the usual test instruments are suitable for testing bridges *in situ*, and also to show why, in our present state of knowledge, X-ray examination is one of the best of the non-destructive methods.

Practical X-ray examination has now reached a relatively high degree of perfection. However, this method of testing is still criticised, not only by the public but also in competent circles, on the grounds that : the cost of the instruments and accessories is out of all proportion to the results obtained; in consequence the financial side of the question is far from clear; and as this method is somewhat dangerous, protective measures have to be taken and make it more difficult and costly to carry out the tests. The opponents of X-ray testing also claim that too much time and labour is required to read the photographs and to set out the results, quite apart from that involved in working the process, in handling the photographic film, focusing the plate, etc... in spite of which the engineer who is not carrying out such an investigation for theoretical reasons has no guarantee that the results will be a definite success.

In face of such criticisms, we must first of all clear our minds of the idea

(1) Sequel of a lecture given at the Röntgen Meeting of the German Foundry Association, in Berlin.

(2) The printing blocks used for the illustrations in this article were kindly lent by Messrs. Rich. Seifert & Co., Hamburg 13.

that radiography will be of real practical use only when it can be carried out automatically. We agree that it would be a mistake, when testing a bridge *in situ*, to use the Röntgen apparatus in places where, up to the present, the ordinary equipment and test methods have given satisfactory results for many years. Exterior examination must be given close attention in the future as in the past. For this, the test method must first of all be easily carried out and must roughly be such as will definitely reveal any defects. Besides, the degree of safety resulting from such exterior examination will always depend upon the sense of responsibility and the practical experience of the engineer carrying out the tests. More highly developed methods of testing ought to be introduced only when this ordinary test method fails to give sufficiently accurate information. The experienced engineer then has to make up his mind as to the scope and nature of the tests to be made, remembering that they will be more difficult and more expensive to carry out. He alone is in a position to keep the cost down by carefully selecting the parts to be subjected to special tests, thereby proportioning the costs of the operation to the value of the information to be collected.

If, for the above reasons the Röntgen tube is not suitable for making ordinary periodic tests, radiography does, however, enable the engineer to know something of the internal changes taking place in materials or of any defects in the structure; the method of penetration by X-rays is the only method known up to the present whereby reliable information on the origin or nature of defects can be obtained, such as ageing phenonema occurring in structural members continuously under load in service.

Among the many large structures in daily service on the Reichsbahn, the metal bridges require the closest inspection as they are continuously subjected to rolling loads. Owing to their large dimensions, bridges do not usually leave the maker's yard ready to put into place, so that the final inspection cannot take place at the works. This means that, after the usual inspection and guarantee tests at the maker's yard, further tests have to be made after erection to make sure that all working conditions are satisfactorily met; in other words, a special test on the site, in addition to the ordinary routine test, is more than

Fig. 1. — Test coach of the Central Office for Construction and Operation, of the Reichsbahn (German State Railways).

Left : Dark room.
Centre : High-tension compartment with the large Seifert isovolt equipment. Maximum power : 500 kV/20 mA.
Right : Engine and working compartment, with motor generator and oscillator.

ever needed if only because of the constant increase in speeds and axle loads.

Quite impartially, it may be said that the other known non-destructive methods cannot be used at present for such tests. It has often been suggested that such processes could be combined with radiography, as for example by using them for the mechanical tests which should precede the more accurate tests by X-rays *in situ*. We must point out, however, that the apparatus in question has not yet got beyond the laboratory stage, and has still to prove its suitability for practical work.

The experienced test engineer, however, looks in quite another way at the apparatus and methods of carrying out non-destructive tests known at present.

The use, in place of radiography, of the fluorescent screen upon which a transparent image can be thrown by means of X-rays and kept visible a fairly long time, has the drawback that the impressions so obtained are purely personal. This method does not meet the requirements of bridge testing as it does not reveal defects clearly enough, because the human eye is relatively insensible to such minute differences of light. It may be said that this method of examination is not, at present, sufficiently developed to meet the needs of the builder. Up to a certain point, the conditions laid down concerning the production of the transparent image on the screen are possibly excessive for constructional work. Nevertheless, if a part has been proved to be defective, by this method, either a straight or a stereoscopic radiograph has still to be made, first to confirm definitely the defects revealed by the fluorescent screen, and secondly, in important cases, to show the size of the defect and the whole area of the defective zone.

It has been suggested that the screen method be used when the thickness of the metal exceeds 30 mm. (1 3/16 inches) by using much higher tube voltages, that is to say rays with much greater penetration power, and not expecting to get the defects particularly well shown up. Up to the present time the said thickness of 30 mm. has represented the maximum limit with which accurate observation can be made. To obtain these luminous contrasts, which up to now the bare eye could not distinguish, involves the use of much greater luminous masses, or else the effect of the existing sources of light must be increased.

It may be questioned, however, whether with more powerful tubes, under this sort of test, simple means are able to reveal the defects in a definite manner, and without any danger to the operator. To answer this question would mean a complicated investigation, all the details of which cannot be visualised beforehand, but the whole operation would be more difficult and, consequently, still less suitable for practical use.

Another method of this kind, used to reveal defects in materials not visible outwardly, is based on magnetism. Obviously this method of testing known as the « iron filings method » can only be applied to constructional materials that can be magnetised. The process is not only ill-adapted to practical needs but is difficult and complicated in use. Apart from the electro-magnet, which has to be of great power and is therefore heavy, for magnetising the part (constructional detail), it is far from easy to apply the filings to parts difficult of access, to projections or to details at steep angles. These difficulties, found in all structures, are still much aggravated by bad atmospheric conditions (rain or wind), especially when we remember that the iron filings are used as a coat to fix, artificially and definitely on the surface, the change that the magnetic dispersion lines undergo under the action of the flux. The clearness of the indications given by this process

cannot be denied; but we cannot be sure that we have achieved the real object of the test, which is to reveal visibly on the surface existing internal defects in the structure, nor that the arrangement of the lines of dispersion has not been upset by outside influences, which means that its value as an indication is lessened or is unreliable when coming to any conclusion.

It has recently been suggested that the picture obtained with the iron filings should be replaced by a sound effect. This process has not so far got beyond the experimental stage, and we may well doubt if it can be applied in practice until someone has succeeded definitely in reproducing the audible indication with the necessary clearness, recording them graphically by, for example, a sound recorder. Certain preliminary work has been done in the laboratory, but a practical demonstration to show that this process will really be effective is yet to come. Furthermore, the image, audible or graphical, so obtained does not give any relative value, because with the first a comparative note of the same period is wanting, and in the second case there is no datum line. These imperfections will possibly be overcome to a certain degree in the future, but there remains to be solved practically the question of the depth of penetration of the magnetic effect that can effectively be used, a question of much importance, for example, in great thicknesses of material, and when examining the complicated parts with which we have to deal in the case of bridges. Here again the same difficulty occurs : the indication of a defective area does not throw any light on the true position of the defect inside the constructional detail. In view of this state of affairs, it is easy to undestand that the test methods just reviewed are not a perfect substitute for X-ray examination.

We will now study the X-ray testing method more closely by describing in particular its various applications to bridge testing.

We will begin with a general review of the most important cases to be solved when testing bridges.

To begin with, contrary to the accepted opinion, X-ray examination *in situ* does not include tests on normal thicknesses of material. Already under ordinary conditions, or when checking work done to consolidate structures, thicknesses exceeding 100 mm. (3 15/16 inches) frequently have to be penetrated. In many cases too, access to the points to be examined is difficult and this prevents the Röntgen tube being placed on the job, so that the tube has to be run at some greater distance from the part than usual. The result is that the efficiency of the X-ray is necessarily reduced, and the period of exposure lengthened proportionally. In addition, penetration of great thicknesses of material sometimes implies exposure times of such lengh that they cannot be allowed if the train service is not to be affected owing to the short time intervals between trains. In addition, in many cases such as when examining welds or reinforcements in concrete, the radiograph must cover as large a surface as possible to save time, as interesting conclusions can only be obtained from large sections of the structure. The application of this process to these large surfaces — at the present time films of 3 × (30 × 40 cm.) [3 × (11 3/4 in. × 15 3/4 in.)] arranged diagonally, or film bands exceeding 100 cm. (3 ft. 3 3/8 in.) in length, are used — means an appreciable increase in the distance of the film from the Röntgen tube. However, as this distance increases, penetration of the X-rays falls off as the square of the distance. The resulting diminution in the efficacy of the rays ought logically to be made good by the working voltage of the tube as the capacity of the penetration depends directly upon this. Frequently the penetration has also to extend to parts placed

in front of or behind the piece to be examined, and in such cases it must be remembered that taking radiographs of these parts often needs a greater tube power than is required by the piece itself. In many cases when constructional reasons prevent the Röntgen tube from being placed at the usual distance from the part to be examined, the « sighted » photographs have to be made from a considerable distance. Cases of this kind arise in metal bridges of complicated construction, for example at the hinge joints. In reinforced concrete structures, it is sometimes necessary to penetrate layers of ballast, or protective coverings, before the rays get to the part to be examined. In all these cases an important factor is the character of the investigation *in situ*, as the operator is often brought up against unexpected difficulties and has to make sudden changes in procedure.

Elaborate tests show that by increasing the working voltage at the Röntgen tube, great thicknesses of material can be penetrated and at the same time the period of exposure reduced. This method of X-ray working promises to be more adaptable to practical requirements, as when testing bridges the defects need not be so clearly shown up as is required in laboratory tests. However for the results of the tests to be good, we must have at our disposal equipment which is reliable, is always ready for use, and will stand up to the severe conditions of the permanent way. To meet such stringent conditions, very carefully designed equipment, such as that designed by the German State Railways Central Office, in collaboration with Messrs. Rich. Seifert

Fig. 2. — High-tension compartment of the test coach, looking towards the engine room.

In the foreground : a Röntgen tube, condensers, and cable connections.

In the middle: the radiometer with 500 mm. (19 11/16 inches) diameter ball and hydraulic resistance with spiral tube.

The switchgear for short circuiting the high-tension gear is carried under the roof.

In the background, in the right-hand corner of the passage a hook-up for the Röntgen tubes can be seen. The door leading to the engine room is open; the portable distribution board will be noticed.

In the left-hand angle, there is a high-tension transformer before which is arranged, in a box, the motor control gear with the resistances for heating the valves. To the left, in the window bay, a high-tension lead out can be seen; the high-tension line is taken off it outside the coach *(see fig. 3)*.

& Co., of Hamburg, has had to be manufactured, and has been used by the Reichsbahn in its bridge tests and similar work.

The question was to combine an X-ray equipment based on well-tried principles and suitable, as far as possible, for general use, and at the same time *simplify* and improve the X-ray method so as to adapt it to practical needs. These demands have been met by a new design which, although based on the existing Röntgen isovolt equipment, can be looked on as an invention of the first order.

The essential features of the new Röntgen equipment as regards construction and operation are as follows :

The big generator has been so designed that it can be taken down easily and the parts easily carried, and can be subjected to rough treatment without danger; these parts can be passed through a carriage window or door if required. The advantage of this is that defective parts can be replaced quickly, or an X-ray apparatus, either completely or partially equipped, can be set up in the shops or in the laboratory. The parts therefore must be assembled by pins and clips so as to avoid the usual long and tedious process of taking them apart. Owing to this original design the equipment can be rearranged at will and the parts examined with ease. It also helps the running of the equipment as a whole and in its parts in the different couplings accepted in X-ray testing of materials (see below).

A particularly important feature of this equipment should be noted, namely the simultaneous use of two Röntgen tubes when making exposures makes it possible to examine two constructional details which are some distance apart, as when carrying out loading tests, etc.; the exposure can also be taken with different angles of radiation when the exact location of the internal defect is wanted without taking an exposure at a second angle. Moreover, two X-ray views of large surfaces and of great lengths can be taken in this way and this usually means an appreciable saving of time, a better use of the available equipment, and therefore more efficient working of the outfit.

The energy required to work this large isovolt set is supplied by a motor generator in the engine room and therefore separated from the high-tension equipment itself (see fig. 1).

If alternating current is available, the plant can be connected up to it. The current can also be taken from a direct-current supply but in this case it must be converted to alternating current by a convertor. The high-tension gener-

Fig. 3. — X-ray examination of the key of a reinforced concrete bridge.

The high-tension cables seen in the foreground have been lifted up and connected to the Röntgen tubes on the top of the bridge. Two radiograph frames, each measuring 30×40 cm. (11 13/16 in. × 15 3/4 in.) are applied against the arch and held up against the structure by timbers built up from the boiler of the locomotive. The staff makes sure that the field of operation is cleared of people.

ator, the motor starter, and the radiometer (see fig. 2) are installed in the high-tension compartment. The two doors giving access to this section are locked by electrical safety devices while the high tension equipment is running. If a door is forced open the supply current is cut off and the high-tension equipment shuts down. The look-out and operating compartment is located outside the high-tension compartment. i. e., behind the partition in the engine room, through the windows of which the high-tension gear can be watched, or even some distance from the high-tension generator. When working in this way, the necessary cables between the control gear and the distribution board are removed with their connections. The high-tension generator consists of two isovolt appliances of *identical dimensions* which work together as a large isovolt unit with a compound Röntgen coupling. The whole group, therefore, consists of two high-tension transformers in iron casings filled with oil, four valves with their heating transformers, four condensers and one heating transformer feeding the heating cathode of the Röntgen tube. The whole equipment is controlled by means of a motor controller in the high-tension compartment (fig. 2). As mentioned above, this control works off a moveable distribution box in the operating compartment outside the high-tension compartment. The ball radiometer controlling the voltage at the Röntgen tube is regulated from the same point by hand-operated control, which allows of readings being taken, without danger, up to the highest voltages, while the equipment is running. The equipment also includes the necessary ammeters and voltmeters. Optical indicators show when the high-tension side is ready for work, and the Röntgen tube is working. A special device is inserted in the wiring and automatically stops the whole equipment at the end of a predetermined time. In addition, a distant control has been provided and this can be worked by a third party, such as the official directing the work some way off, who can instantly stop the whole high-tension side, including the Röntgen tubes.

In spite of the very restricted space available in the high-tension compartment for the high-tension generator, it

Fig. 4. — Oblique X-ray examination of the abutment of a reinforced concrete overbridge.

The views have usually to be taken at night, as during the daytime intervals between trains are too short to allow of X-ray work being carried out.

In the foreground the high-tension conductors are seen carried on insulated supports.

In the background at the spring of the arch the Röntgen tube (small luminous circle to the left on the structure) is seen. The frames are held up against the front wall of the structure by means of wooden sleepers. The test ground is railed off over a radius of 50 m. (164 feet) by an earthed cable, and watchen take care that the area is kept clear of people.

has been possible to provide a gangway alongside the equipment, so that the staff can pass through it when the equipment is stopped. As a result, the X-ray test van can be attached to express passenger trains without any trouble.

In principle, this large isovolt installation works in the same way as the isovolt plant previously used by the Reichsbahn. Besides the advantages described above, the new type enables to push the use of X-rays according to the kind of coupling and voltages used, up to 500 kV. and 20 milliamps., the natural result of the association of two isovolts of the same sort in compound.

Fig. 5. — Vertical X-ray examination of the arch at the middle of a bridge (see fig. 4).

Rake of coaches ready for taking the radiographs. The tube is placed on the roof of the middle coach and the rays directed upwards through the arch. To the right : the control point from which the whole equipment is distant-operated. The man in charge transmits his orders to the engineroom by megaphone.

The following circuits can also be arranged on the new equipment by simple switches :

1. Circuit for pulsatory current to the Röntgen tube up to 500 kV. with 4 valves (Zimmermann circuit);

2. Circuit for pulsatory current up to 300 kV. with 2 valves (Zimmermann circuit);

3. Circuit for constant continuous current, up to 300 kV. with 4 valves (Greinacher circuit);

4. Circuit for constant continuous current, up to 200 kV. with 2 valves (Greinacher circuit);

5. Circuit for pulsatory current, up to 200 kV. with 1 valve (Villard circuit);

6. Circuit for alternating current with half period suppressed, up to 100 kV., used with one valve or with none.

If, for example, the *Zimmerman circuit* be used with 4 valves, the *high-power Röntgen tubes* can be worked up to their maximum loading capacity. It is also possible, as we have seen, to *operate at the same time a second Röntgen tube* of the same power as the first. This reserve of energy has never before been available anywhere for technical X-ray testing carried out on the job. At the same time provision has been made for future developments, as the use in shop tests of Röntgen tubes capable of carrying much greater loads (above 450 kV.) will only be a matter of improved financial conditions. Naturally tubes which work at *less than the maximum load* can be used. For example, if in special cases the equipment is not fully used, the Zimmermann circuit can be used with 2 valves when 2 Röntgen tubes are quite sufficient. The two Zimmermann circuits (with 2 or 4 valves) supply the Röntgen tube with pulsatory current which, as we all know, allows of the Röntgen tube being loaded with stronger currents without diminishing

the resistance in spite of a longer irradiating period; against this, longer radiating time is required than with constant continuous current with the Greinacher circuit (the proportion is about 2 to 3) but the difference can be put up with if at the same time high voltages are used. From the financial point of view, we have on the one hand a lower consumption by the valves and tubes, and on the other, rather longer radiation times. When the time must be reduced as much as possible, a suitable rearrangement of the details of the equipment is all that is needed to substitute for the Zimmerman circuit the *Greinacher arrangement* which maintains the current at the Röntgen tube constant. With this circuit when the equipment works with 4 valves, the maximum voltages at the Röntgen tube can be as high as 300 kV.; they are 200 kV. when working with 2 valves. With this circuit two Röntgen tubes can be worked simultaneously. For the lower tube loads, as when taking radiographs of single thicknesses of plate, the *Villard circuit* is used as it only requires 1 valve and supplies to the Röntgen tube 200 kV. of *pulsatory current* but the efficiency is only *half that of the corresponding Zimmerman circuit.*

Thanks to the use of this circuit, the consumption of the valves and tubes is still further reduced, but at the expense of the radiation time. This method of coupling is therefore used with thin thicknesses of material, when time is available for a longer penetration. In laboratory work and especially in very accurate investigations into the structure of metals, which will be included in the future research programmes, provision has been made for the circuit *usual* in such work using alternating current *with half period suppressed*, the voltages of which may reach 100 kV. Two Röntgen tubes can also be worked at the same time with these two circuits.

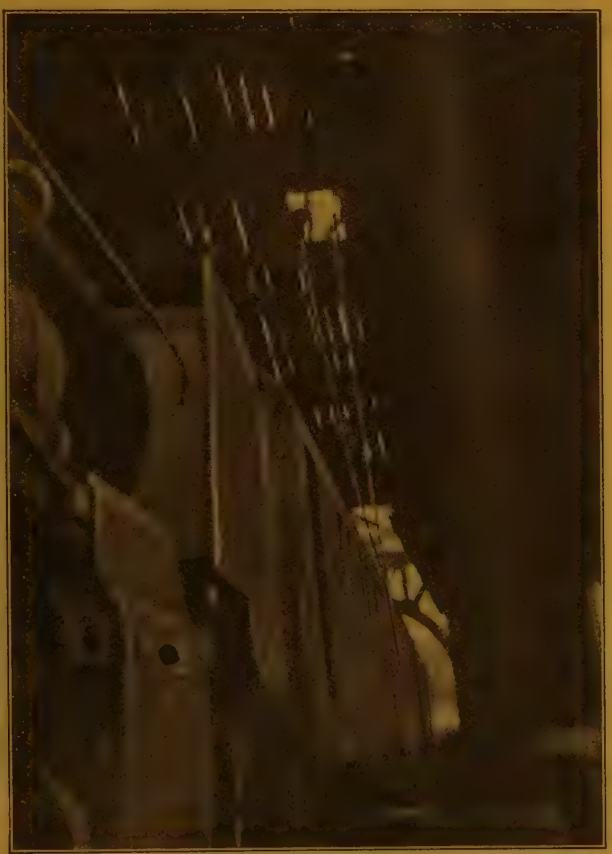


Fig. 6. — The rake of test coaches on the Hohenzollern bridge at Cologne.

The high-tension conductors rolled up on drums in cases carried under the coaches are brought up onto the bridge.

The equipment can also be split up and one of the isovolt units removed. A laboratory service can then be set up using the two above-mentioned Villard circuits, with suppressed half period, and the Zimmermann and Greinacher circuits, each with two valves. The surplus parts, when the equipment is divided up in this way, can be re-assembled into an isovolt unit and be used separately with its own control for the second unit.

To sum up, this large isovolt installation has provided the radiographical service of the Reichsbahn's Central Office for Construction and Operation with a non-destructive test instrument which can be used in all kinds of investigations in a way previously impossible.

Steps have also been taken to minimise the effects of unexpected disturbances.

As serious damage to important parts of the X-ray outfit might result in the whole equipment being stopped, the large isovolt equipment has been designed and made in such a way that if any defect occurs in *any* isovolt unit, the defective part can be at once replaced by sound fittings from the other unit and a temporary service maintained until spare parts come to hand.

Fig. 7. — The rake has left the test area to clear the track for service.

At the right top, part of the platform used in the tests can be seen.

The large isovolt installation is connected up to a high-tension line which takes the current from the high-tension generator to the foot of the structure to be examined. The connection to the Röntgen tube, or possibly the two Röntgen tubes, is made at the site. While working, the tubes are carried on a simple collapsible stand. The films are held in frames or envelopes of opaque paper against the face of the object farthest from the tube. After checking over the equipment, the staff withdraws to a safe position : the power is then switched on to the Röntgen tube and the radiograph properly speaking taken (see fig. 5). The high-tension line mentioned above makes it possible to take radiographs at such great distances from the control point [the average distance is 50 mm. (164 feet) at the present time and can be doubled] that the rays

are in no way dangerous to the staff (fig. 5). Tests carried out by the Reichsbahn's Central Office have shown that this method of working with X-rays can be described as harmless to the operators, provided they comply with the special regulations issued by that Office.

The same applies to protection against high-tension currents. First of all, the high-tension zone is closed in while the current is on, so that any unauthorised or unnecessary entry into this area while the equipment is under high-tension is made impossible (fig. 2). In addition all metal parts near the high-tension equipment, which might become loaded, are earthed, which gives a more definite guarantee, against flashing over which might occur, for example, when the air is very heavily saturated with humidity or smoke as under large overbridges which can be likened to tunnels, or when there is much dust, etc. Finally the whole of the metal coach has been properly earthed. To meet all unexpected eventualities, each time a radiograph is taken, the whole field of operation is amply enclosed to prevent access to it (fig. 4).

Fig. 8. — View from below of the middle platform.
The high-tension conductors are ready for connecting up to the Röntgen equipment.

As regards interpreting the results of the tests, the opponents of the method criticise chiefly the difficulty in reading the film of radiographs. To this may be replied that any accurate test method always presumes that the men who have to record and interpret the results have special technical training and some familiarity with the object of the investigation. X-ray testing cannot be expected to be an exception to this rule. If the staff is properly selected and carefully trained, experience has shown that the real condition of the parts is revealed by X-ray examination with certainty.

As regards the plant needed for generating the X-rays, it may be said that the construction of high-tension generators is now entirely satisfactory.

Opinions are more divided as to the type of tube to use. In trying to provide tubes which are screened from contact and from the radiation, unfortunately too little notice has been taken of practical requirements. The new tubes guaranteed against radiation are too bulky and too heavy, and too awkward to handle for testing bridges *in situ*. They are also much too delicate and require extreme care; they are very costly as compared with unscreened tubes, and so far we have no idea of their life in the open. Now, in the case of practical applications, any complication is to be avoided, and among such the cooling pump which is used to remove heat generated in the tube must be given first place. As X-rays can now be used outside the laboratory and over great distances without mishap, the necessity for providing special protection against contact with, and radiation of, the Röntgen tube no longer exists in practice, and the condition of absolute working

regularity has been put in the front rank. This is the chief reason for the relatively simple use of the unprotected and uncooled tube. However, measurements are still regularly taken to ensure that the staff working outside the isolated zone is really and fully protected from radiation. As working voltages exceeding 200 kV. are still not considered in the important technical investigations as suitable for producing satisfactory photographs, little progress has been made in the way of bringing forth satisfactory tubes of corresponding power.

If, therefore, protection against radiation is not required in connection with this type of tube (Osram A.E.G.), there remains that the unscreened tubes are better in practical use; they have the advantage of being much cheaper and lighter in weight, much simpler to keep in working order, easier to handle, and special cooling pumps are unnecessary (figs. 4 and 5).

In brief, we can say that for the examination of structures *in situ*, the Reichsbahn's X-ray equipment perfectly meets the requirements as to capacity and reliability for constructional work.

In this connection we must say something about the radiographical examination of constructional materials, by gamma rays from radium, radiothorium, mesothorium, and by emanation, of which there has been frequent mention in recent years. As the opinions expressed on the results so far obtained in laboratory and shop tests are still so very divided, an investigation from the point of view of the civil engineer would be premature. In spite of the relatively simple working of this process, it is inferior to the Röntgen method, mainly because the defects are less sharply defined. In addition, radiography with gamma rays requires an inordinately long time, not consistent with examinations carried out *in situ*, especially on parts in motion. We shall have to leave to a future experimental investigation the task of demonstrating to what extent tests by means of these radio-active materials can be used in constructional work.

In what precedes, we have only given a review of the more important non-destructive testing methods known up to the present, which have been applied outside laboratories and shops. We do not wish in any way to deny the value and importance, as regards laboratory work, of the non-destructive test methods we have here compared with the Röntgen process. The extent to which they have already given useful results has been demonstrated elsewhere from another aspect, so that we need not deal with them any further here. The question whether these processes will supplement or replace sooner or later the Röntgen method must, if we are to avoid coming to a premature conclusion, wait an answer until data based on a wide series of practical tests has been collected.

In selecting the apparatus to be used in each case, a very definite distinction must be made between tests which can be carried out in a more or less current way on parts which, though of little importance as regards the condition of the structure, form the major part of the examination, and on those parts of vital importance in the structure. When making ordinary tests, simple and readily handled equipment is used since in this case the operators are able to form their conclusions from their practical experience; when testing essential parts, the distinct revelation of the internal defects becomes of great importance as the information to be learnt from the exterior condition alone is insufficient. The road to be covered to attain this end is far from easy and takes time; however, this time is required to collect the practical data which no theory can replace.

[621 .133.4 & 621. 133.5]

Locomotive smoke-box conditions.

(Engineering.)

An editorial written eight and a-half years ago (1) on the subject of locomotive smoke-box conditions concluded by saying that further light on the problems involved in the ejector action of the exhaust steam in the locomotive firebox would be welcome to all who believed that there was still a good deal of life in the steam locomotive.

Every successful locomotive since Stephenson's day has depended on the exhaust action of the steam to provide the large volume of air necessary for combustion. In spite of this, no generally acceptable theoretical analysis of the ejector action of the jet has been developed. It has been recognised that the action depends largely on the frictional contact between the surface of the exhaust jet and the smoke-box gases to be ejected. At a given rate of operation, the locomotive cylinders require and exhaust a certain weight of steam. To produce this weight of steam a certain quite definite amount of air must be taken through the firebox. The amount of air required to produce a pound of steam will depend on the boiler design, on the fuel used, and on the rate at which the boiler is worked. In general, with a given boiler and fuel, the rate of air supply will determine the rate of combustion and the boiler efficiency, and will, therefore, determine the rate of steam production. A definite rate of air supply will correspond to a definite rate of steam production. The steam in passing out of the exhaust nozzle and through the stack must entrain and eject the necessary amount of air. Entrainment is dependent on the velocity with which the steam leaves the nozzle and on the design of nozzle and stack. A high steam velocity requires a high exhaust pressure. As the back pressure reduces the cylinder power of the locomotive, it is desirable to design the exhaust nozzle and stack so that the least possible back pressure is required to move the air.

The rate at which steam is exhausted, back pressure, and rate at which air is supplied, are the three fundamental factors to be considered in any examination of smoke-box conditions. Unfortunately, many locomotive tests are made without a determination of the air supply. Direct measurement is practically impossible, but the rate at which air is supplied can be found easily from analyses of the smoke-box gases. Lacking exact information as to the amount of air moved, many experimenters have used the draught in the smoke-box as a criterion of the effectiveness of the exhaust. This is not wholly satisfactory because the draught is dependent not only on the rate of air supply, but also on the resistance of the boiler passages through which the air is moved. Boilers of different design cannot be compared on the basis of draught measurement, and in any one boiler the resistance varies with the condition of the fire. With this general information as a basis, design of the locomotive front-end is purely empiric. No organised body of theoretical knowledge is available on which to base exact calculations.

An interesting contribution to our knowledge of locomotive smoke-box conditions has been made by a Bulletin from the Engineering Experiment Station of the University of Illinois (2). The Bulletin opens with an excellent review of previous work, starting with Zeuner's work in the early 'sixties and carrying through to recent Continental studies. It is to

(1) *Engineering*, vol. cxx, page 109.

be gathered from this review that those who have mixed the most mathematics with their analyses have been the least successful in making a practical contribution to general knowledge of smoke-box conditions.

The summary serves as an introduction to a presentation of information obtained from an extensive series of experiments with a quarter-scale model of a locomotive front end. This was a scale reproduction of a typical American locomotive smoke-box complete with netting and all fittings. A metered air supply was admitted through boiler flues and superheater pipes arranged as in the prototype locomotive. Steam for the exhaust was furnished by the University power plant through a meter. Rate of steam and air flow and the exhaust steam pressure could be measured with any desired combination of nozzle and stack and the form of the jet could be observed. Careful study of results obtained with the model and comparison with actual tests on locomotives leads to the conclusion that when due regard is paid to conditions of similarity, conclusions reached on the model can be transferred in their entirety to a similar locomotive.

Professor Young presents in the Bulletin conclusions based on nearly four thousand tests representing a thousand different conditions and nearly three hundred different combinations of nozzle and stack sizes and designs. All accepted tests could be duplicated.

One of the first questions studied was the relation between pulsating and continuous flow of the exhaust steam. The tests showed conclusively that for a given rate of steam flow the ejector effect was the same whether the steam escaped in successive pulsations or in a steady stream. This point has been much debated in connection with the locomotive exhaust. We believe that Lipetz and others have contended that delivery of the steam to the nozzle in short rapidly-succeeeding puffs, as at high speed or from a multi-cylinder engine, is more efficacious than delivery in slow heavy puffs. Dr. Goss, Mr. Lawford Fry, and the observers of the Altoona locomotive test plant have taken the opposite view, maintaining that with a given front-end arrangement the weight of gas moved would depend only on the weight of steam exhausted, and that it was immaterial whether the exhaust came from cylinders with long cut-off at slow speed or with short cut-off at high speed. Confirmation of this view can be found in a study of the relation between weight of steam exhausted and weight of gases moved. If this relation is plotted for locomotives tested on the plants at Altoona or the University of Illinois, a smooth curve will be found for each engine, and it will be impossible to distinguish between long and short cut-off tests. Professor Young quotes from a series of articles on « Modern Locomotive Design and Construction », in the *Railway Engineer*, 1917-1918, the definite statement, « Experiments have proved that there is little difference in the weight of gases carried away by a given weight of steam, whether the blast be continuous or intermittent. » His model experiments confirm this completely and should go far towards ending the controversy on this point.

Study of the jet form showed clearly that the ejector action of the exhaust steam was due in part to surface friction between the smoke-box gases and the steam jet, and in part to the gases entering the jet and mixing with it. This has been recognised in practice and various forms of nozzles have been designed to increase the jet surface and thus move more gas per pound of steam at the same

(2) *A study of the Locomotive Front End, Including Tests of a Front End Model*, by Prof. Everett G. Young, Research Professor of Railway Engineering, Bulletin No. 256, Engineering Experiment Station, University of Illinois, Urbana, U.S.A.

velocity. The Goodfellow nozzle with four projections, nozzles with single and double bridges, and a nozzle with four circular openings were tested and found effective. Such nozzles, however, offer greater resistance to the steam flow than a nozzle with a plain circular opening and require a larger area for the same steam flow if the exhaust pressure is not to be increased. Professor Young says that, compared with a standard circular nozzle, the greatest increase in weight of gases moved by any special nozzle was about 12 %. Taper stacks were shown to be slightly better than cylindrical. Any increase in height of stack improved its performance. In practice, of course, the height of the top of the stack is usually fixed by clearance conditions, and the position of the base of the nozzle by the locomotive design. The problem then is to divide up the space between these points to the best advantage. There must be sufficient opening between the base of the stack and the nozzle to provide free influx for the gases. In the tests good results with a plain circular nozzle were obtained when the distance of the stack base from the nozzle was four nozzle diameters, and when the diameter of the stack base was also about four times the diameter of the nozzle. To provide for smooth entrance of the gases to the stack, a quadrant-shaped flare increasing the stack diameter by 40 to 50 % is sufficient. No gain was found by using a long easy flare. Any angular change in stack diameter should be avoided.

In general, the model experiments do not make any new and startling revelation regarding smoke-box conditions. They confirm much of the work of earlier students of the subject and indicate, as has been done before, that in changing stack and nozzle designs the approach to and recession from the best combination is gradual. There is no sharply-defined best combination. As the optimum condition is approached, there is a moderately wide range of stack and nozzle sizes which will work satisfactorily together.

After presenting and summarising the experimental data, Professor Young suggests the desirability of developing a variable exhaust nozzle to make it unnecessary for a locomotive to work at powers ranging from 300 H. P. to 3 500 H. P., with the same draught appliances. Variable exhaust nozzles have been used on the Continent, but have found little favour in England or America. Professor Young attributes this to mechanical difficulties, but it is hard to believe that these would not have been overcome if there were any important advantage to be gained. The model experiments and actual locomotive tests indicate that very little gain can be expected. The Altoona tests of the Pennsylvania Railroad L 1-s locomotive show that at full power, 49 000 lb. of steam exhausted moved 86 000 lb. of gases, with a back pressure of about 15 lb. per square inch. The figures are approximate and correspond to 1.75 lb. of gas per lb. of steam. At half the above rate of working, 24 500 lb. of steam at 3.5 lb. per square inch back pressure moved 45 500 lb. of gases, or 1.85 lb. of gas per lb. of steam.

In a properly-designed locomotive, the exhaust will be designed to secure the best possible results at maximum power. Any gain from the variable exhaust must, therefore, be made at the lower powers. The model experiments show that the maximum improvement of a special over a standard nozzle is about 12 %. A reduction of 12 % in the back pressure of 3.5 is only 0.4 lb. per square inch. At half power, the mean effective pressure of the L-1-s ranges from about 50 lb. per square inch at 30 % cut-off to about 150 lb. per square inch at 60 % cut-off. Consequently, the gain in power to be expected from the variable exhaust is less than 1 % under the most favourable conditions. This is not sufficient to justify the complications involved.

[621. 43 (.73)]

The world's largest locomotive Diesel engine

(Busch-Sulzer designs developing 1 600, 2 000 and 3 500 B.H.P.).

(Diesel Railway Traction, supplement to *The Railway Gazette.)*

We have more than once commented upon the growing necessity for a Diesel engine suitable for railway traction which would develop an output of 1 500 B.H.P. or more, and suggested that this could be met only by the adoption of the two-stroke principle. It is therefore gratifying to be able to record the construction of an engine producing 1 600 B.H.P. at the normal rating. As might be expected, this design was developed in the U. S. A., where the locomotive powers required for anything but shunting work are far beyond the capacity of the existing railway-type oil engines.

The first engine to this design has been undergoing bench tests at the works of the designers and builders, the Busch-Sulzer Bros. Diesel Engine Company, of St. Louis. It is of the V type, with eight two-stroke single-acting cylinders, 13.5 inches diameter by 16 inches stroke, and gives an output of 1 600 B.H.P. at 550 r.p.m., the corresponding piston speed and brake m.e.p. being respectively 1 465 feet per min. and 63 lb. per sq. inch. The weight of the engine is slightly under 25 lb. per B.H.P., and the design provides for the addition of further pairs of cylinders up to a total of 16 cylinders developing 3 500 B.H.P. at 600 r.p.m. By courtesy of the Busch Sulzer Bros. Diesel Engine Company, we are able to present sectional drawings of the engine.

Cylinders and crankcase.

The engine main frame and cylinder block are integral, and are cast of iron or aluminium alloy, depending upon the weight limitations. The frame has large but light oil-tight inspection doors on each side. An oil trough is attached to and below the frame, and the working parts are thus fully enclosed in an oil and vapour-tight structure. The block and liners are so arranged that each cylinder has a sludge chamber near its lower end. This chamber is fitted with upper and lower oil wiper rings through which the piston works and which prevent dirty oil, sludge and sparks, from the combustion end of the cylinder, from passing into the interior of the engine frame or crankcase, and oil from the crankcase from being carried into the upper part of the cylinder. Each sludge chamber has an opening on the outer sides of the engine protected by a glass cover through which the piston may be observed while the engine is running, and its proper lubrication thus assured — avoiding excessive as well as insufficient lubrication. The sludge chambers are electrically lighted.

That portion of the block situated between the two rows of cylinders serves as a distributing receiver for the scavenging air, and in it are located the automatic scavenging valves, attached to the faces of the block. The top of this space is closed in by the housing of the scavenging blower, which extends almost the full length of the engine. It is driven through gears and a flexible coupling from the engine crankshaft. For those engines exceeding 1 600 B.H.P., i. e. more than eight cylinders, two blowers are employed, one for each bank of cylinders. The air inlet duct to the

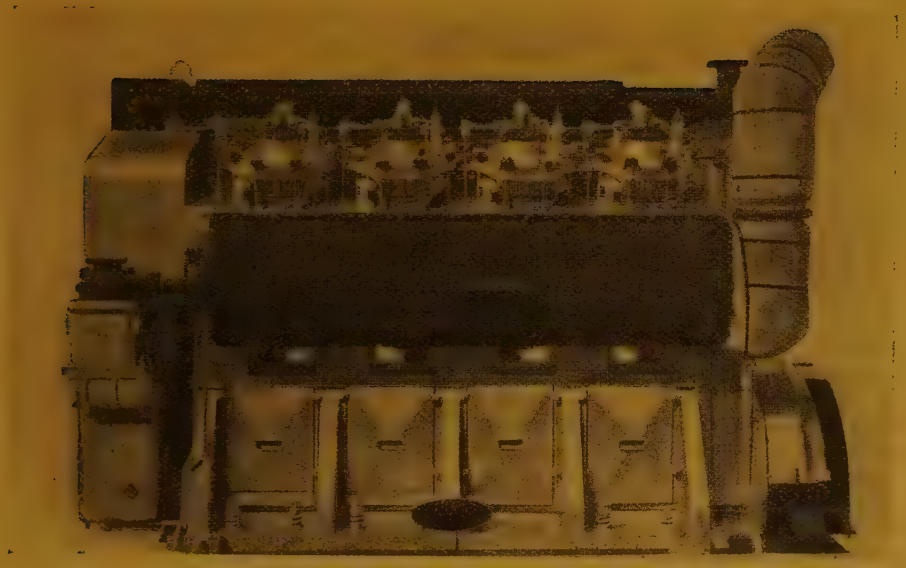


Fig. 1. — 1 600-B.H.P. two-stroke Busch-Sulzer Diesel engine.

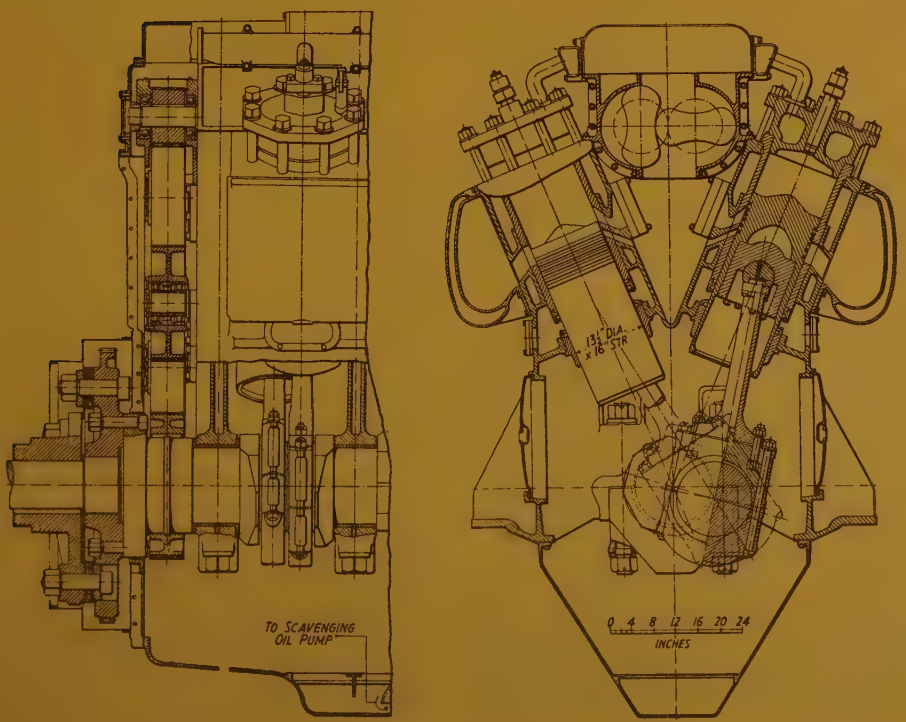


Fig. 2. — Longitudinal and cross-sectional elevations of 1 600-B.H.P. locomotive Diesel engine.

blower runs along the top of the housing. In a chamber, at the end of the frame farthest from the generator, are contained the fuel injection pumps, the governor and its mechanism, and the cylinder lubricating pumps.

Moving parts.

The crankshaft is a single steel forging, of heat-tread steel. Each crankpin serves for two opposite cylinders, so that the number of cranks is half that of cylinders. An integral coupling flange is forged on the generatoir end of the crankshaft. The main bearings consist of upper babbitt-lined half-shells, in seats formed in the frame, and lower similar half-shells carried in substantial forged inverted caps, which are fitted into the frame and supported by heavy bolts of alloy steel, the shells themselves being forged of aluminium.

The connecting-rods are heat-treated open-hearth steel forgings, and are bored throughout their length, for the passage of lubricating oil to the gudgeon pins. The gudgeon pins are of hardened steel, ground and polished on their working surfaces. Each pin is rigidly bolted to the flange at the top end of its connecting rod, the flange resting against a flat surface milled into the power side of the pin.

The assembled gudgeon pin housing and piston form a single structure of aluminium alloy. The housing is attached to the inside of the piston, and incorporates the pin bearings, so that the piston itself is free from the heavy bosses usually required for the attachment of the pin, and the walls of the piston skirt are not pierced by any holes. Thus all transverse sections of the piston proper are concentric, symmetrical, clased circles, avoiding distortion and leakage of lubricating oil to the cylinder. All pistons, housings and connecting rods with their bearings and pins throughout the engine are alike, the axes of the companion cylinder pairs being offset to permit this.

Exhaust and scavenging.

Along the front of each line of cylinders extends a water-jacketed exhaust header, into which the cylinders on that side exhaust. Oil-catching and spark-arresting provisions are connected to each header, and are arranged to drain to the roadbed. The exhausting, scavenging, and fresh air charging of the cylinders are performed through ports in the cylinder well. The exhaust ports are controlled by the pistons, and are located around one half of the circumference of the cylinder, communicating directly from the interior of the cylinder into the exhaust header.

Scavenging and charging are on the Sulzer system, with two tiers of ports round one half of the cylinder circumference, opposite the exhaust ports. The upper tier, which is uncovered by the piston before the exhaust ports are uncovered, is controlled by automatic valves, opening towards the interior of the cylinder. These valves are located in the crotch receiver, as previously described, and prevent a blow-back of exhaust gases into the receiver, as they remain closed until the pressure in the cylinder has fallen below that of the air in the receiver. The scavenging ports in the lower tier form a direct communication from the receiver into the cylinder, and are uncovered by the piston after the exhaust ports have been so uncovered, and when the pressure in the cylinder has fallen well below that of the scavenging air. On the return stroke of the piston the scavenging ports in the upper tier remain open after the exhaust ports have been covered by the piston and the flow of air, for the charge continues until these scavenging ports have been so covered, the cylinder thus being filled with fresh air at a pressure above that of the back pressure of the exhaust. This effects a moderate degree of supercharging, without separate machinery for this purpose. Scavenging air is furnished by a blower of the ro-

tary positive-displacement type, with top suction and bottom discharge. It is driven through gears and a flexible coupling from the crankshaft. The air passes through filters and a muffler in its passage to the blower, and is discharged directly into the crotch receiver.

Fuel system.

The fuel injection system is of the A.E.G.-Hesselman type, and comprises a fuel booster pump, a fuel injection pump, fuel filters, and fuel valves. The pump is under governor control, and measures and delivers to the fuel valves the quantity of fuel appropriate for the existing engine load and speed. The pump plungers are operated by hardened steel cams on a shaft that is driven from the engine crankshaft, through gears. The quantity of fuel delivered to the cylinder at each delivery stroke of the pump is regulated by the point of opening of a spill valve on the pump. This point is varied by the engine governor, being earlier when the governor collar is in a high position, *i.e.*, when the load is light and little fuel is needed, and later when the governor collar is in a lower position, and the load heavier. Thus the first portion of the plunger discharge is that which goes to the working cylinder, and the fuel that is released by the spill valve returns to the fuel supply line of the pump. To ensure the filling of the pump barrels at each suction stroke, the fuel supply is put under moderate pressure by a booster pump, and the delivery pressure of the fuel injection pump is about 4 500 lb. per sq. inch.

Fuel is delivered, by each plunger of the fuel pump, to its individual fuel valve, passing on its way through a fine filter. The fuel valves are of the A.E.G.-Hesselman membrane-spring type, and communicate with the spray nozzles in the cylinders. The valves are opened by the pressure of the fuel oil as soon as the respective pump plunger begins to deliver fuel, and are closed by the membrane springs as soon as the oil pressure is relieved by the opening of the spill valve. The shape and rotative position of the fuel pump cams therefore control the timing of the commencement of injection into the cylinders.

In engines operating at constant speed, the fuel lead, *i.e.*, the point ahead of top dead centre at which the injection of fuel begins, is constant; but this engine, intended to operate at any speed between half and full, is provided with an automatic device for varying the fuel load to suit the engine speed, increasing it at the higher speeds and diminishing it at the lower, and thus preventing the violent ignitions and dangerous rises in pressure that would occur if the time period for ignition before top dead centre were unduly lengthened. This makes it possible to maintain substantially constant full torque at all engine speeds. The fuel is sprayed through the atomising orifices of the spray nozzle into the combustion chamber, which is of the A.E.G.-Hesselman contour, where it is ignited.

A centrifugal governor controls the engine, and maintains the speed at that for which the governor is at the time adjusted, *i.e.*, anywhere between half and full speed. The adjusting of the governor is accomplished by a hand operated device, which permits the variation of the operative speed of the governor from a remote point. Thus the engine may be run at the speed that is most advantageous for the existing locomotive speed and load. The driver's control of the engine speed is incorporated with the control of the traction motors where electric transmission is employed.

Lubrication.

The general lubrication of moving parts of the engine is on the pressure system. The oil flowing from the lubricated parts, and including the clean oil wiped off by the lower rings in the

sludge chamber, is gathered in the oil trough under the engine, whence it is re-circulated after being filtered and cooled. There are two centrifugal pumps for circulating the lubricating oil, one to draw the oil from the trough and deliver it to the coolers, the other to draw it from the coolers and deliver it, under pressure, to the engine bearings and other parts requiring lubrication. Separate mechanical lubricators are provided for the lubrication of the cylinders, and these are automatically kept filled with clean oil.

* * *

The largest locomotive Diesel engine hitherto in existence in the U.S.A. is the Krupp 1 000-B.H.P. supercharged unit installed in the Baldwin shunting locomotive, and thus it will be seen that a distinct advance has been made in tackling the problem of producing a Diesel engine equivalent in power to the normal American steam locomotive. The first 1 600 B.H.P. engine has operated well over 500 hours on the test bed, including a continuous run of 48 hours at three-quarters to full load. The fuel consumption records of these tests showed that at three-quarter load at half speed the consumption was 0.41 lb. per B.H.P.-hour, and at a full load and speed 0.424 lb. per B.H.P.-hour.

Three locomotive designs embodying this type of engine in different sizes have been got out by the Busch-Sulzer Bros. Company to suit varying American duties. The first is a 102-ton Bo-Bo shunting and short-distance passenger

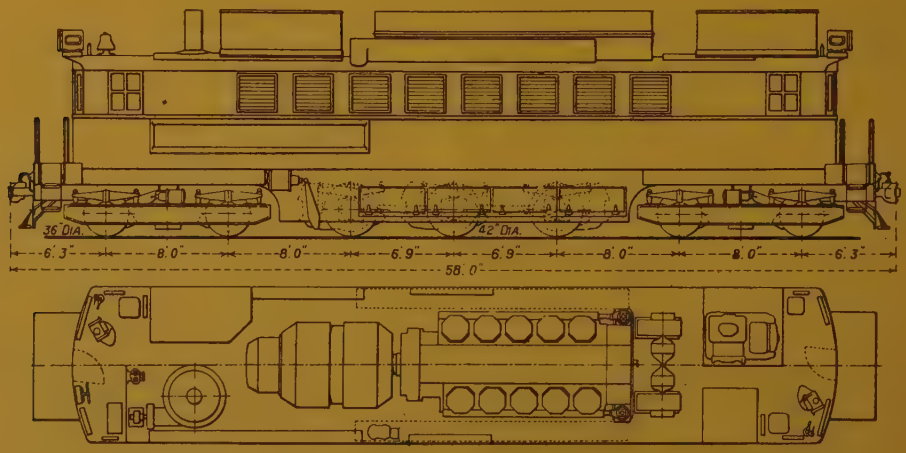


Fig. 3. — Design for 2 000-B.H.P. passenger locomotive with Busch-Sulzer two-cycle engine.

and goods locomotive of 1 600 B.H.P.; the second is a 150-ton 2-Co-2 express passenger locomotive of 2 000 B.H.P.; and the third a 192-ton 2-Do-2 heavy goods locomotive of 3 500 B.H.P. All three types embody electric transmission and force-ventilated nose-suspended motors. The latter are noteworthy in that they will be required to develop 875 H.P. per armature in the heavy freight locomotive, a figure which has so far been unapproached with axle-hung motors.

The design for the passenger locomotive is shown in one of the accompanying illustrations. A cast underbed is employed, but frames of the normal type

are dropped down to carry the three driving axles. The starting batteries are carried in cases outside the driving axle-boxes, but if it is intended to make the latter of the roller type the inaccessibility of their position is not of great consequence. Two cooling-water radiators are located on the roof and an oil-fired heating boiler is installed. The control is almost entirely automatic, and the transmission is designed to take up the maximum engine power at all road speeds. Starting is effected with all the traction motors in parallel, and a tractive effort of 47 500 lb. can be maintained up to 5.0 m.p.h. At approximately 40 m.p.h., a portion of the traction motor fields is shunted, and this carries the locomotive up to the maximum speed of 75 m.p.h. at which the tractive effort is 7 000 lb. The general capacity is equivalent to the haulage of an 11-car train weighing 775 tons on the level at 60-65 m.p.h. An adhesion weight of 81 tons is estimated, giving a maximum axle load of 27 tons.

The 3 500-H.P. freight locomotive design has an overall length of 62 feet, a rigid wheelbase of 18 ft. 6 in., 48-inch wheels, an adhesion weight of 111.5 tons, and a maximum tractive effort of 75 000 lb., which can be maintained up to a speed of 10 m.p.h. Starting is effected in series-parallel, and changed over to series-parallel with shunted field at 43 m.p.h. The maximum designed speed is 70 m.p.h. The design for shunting and local traffic has an overall length of 43 ft. 6 in., a bogie wheelbase of 7 ft. 9 in., 38-inch wheels, and a maximum tractive effort of 70 000 lb.

Estimates made on the working cost of the 3 500 B.H.P. freight locomotive, with conditions as they now exist in the middle west of the U.S.A., indicate that a saving in working costs of 45 % should be possible compared with an oil-burning steam locomotive of equivalent power. This, however, does not include interest and depreciation charges. The main saving is in fuel, the makers estimating a cost of about 33 % of that of a steam engine.

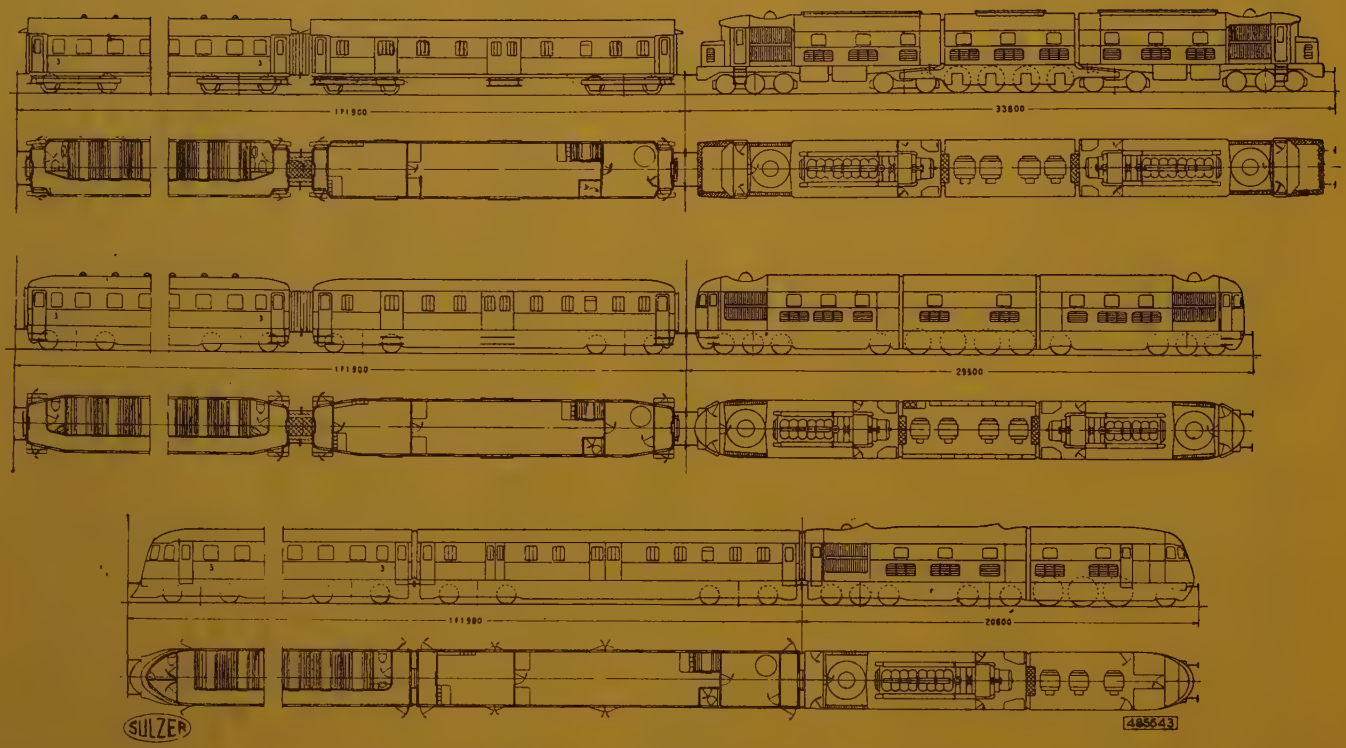
[**621**. 335 & **621**. 43]

Possibilities of high speed with streamlined Diesel trains.

(Diesel Railway Traction, supplement to *The Railway Gazette.)*

There is little doubt that a vast market awaits the high-speed Diesel train, whether in the form of a locomotive and coaches or as a triple-articulated train set, for it can provide a cleaner, faster, and more economical service than can be attained with steam traction. In the range of really high speed, air resistance is the dominating factor in the exterior design of the train, and with trains of normal construction it increases by well over 100 % with an increment in speed from 60 to 95 m.p.h. Much attention has recently been given in Britain, America and on the Continent to the possibilities of streamlining, and some of the advantages to be gained in operation by this form of construction are given detailed consideration in this article, and are based on the design of streamlined and semi-streamlined locomotives and trains evolved by Sulzer Brothers Ltd. as a result of extensive study.

Figures 1 and 2 show three trains with practically equal accommodation and designed for the same speed, namely, 80 m.p.h., the first train being of orthodox construction, the second somewhat improved as regards shape of



Type 1. — Normal train; Diesel-electric locomotive of 3 900 B.H.P.
» 2. — Improved shape; » » » » 3 000 »
» 3. — Fully streamlined shape; » » » » 2 300 »

Fig. 1. — High-speed trains with Diesel-electric locomotives for a maximum speed of 80 m.p.h.

vehicles, and the third a train streamlined as far as is practicable. With regard to the second train, the locomotive and coaches, including the rear one, can run in either direction, as the shape of the ends of the locomotive and coaches have been only partially streamlined. End and side panels are extended downwards below the frame in order to shield the bogies and intervening space, the design embodying, from considerations of air resistance, improvements over the usual form of construction shown in the first example.

The third train is one of fixed composition and is intended to run in one direction only. At terminals, therefore, it will be necessary to turn the whole train round, or alternatively shunt the locomotive and end coach, an operation which it is claimed offers no particular difficulty. With this train arrangement it is possible to give a good streamline contour to the front of the locomotive and to the end of the rear coach. At the same time care has been taken to keep the distance between the locomotive and the leading coach, and the spaces between intermediate coaches, as short as possible, although retaining standard buffing and draw gear. Side walls are extended downwards as in the case of the second train but as a further improvement they are carried beyond the buffer beams and the vestibules brought out in line with the side panels, thus greatly reducing air resistance. Every precaution has been taken to avoid unnecessary projecting parts, the sides and roof being made as smooth as possible, usual type roof ventilators for example being replaced by the more up-to-date method of forced ventilation in conjunction with air conditioning plant.

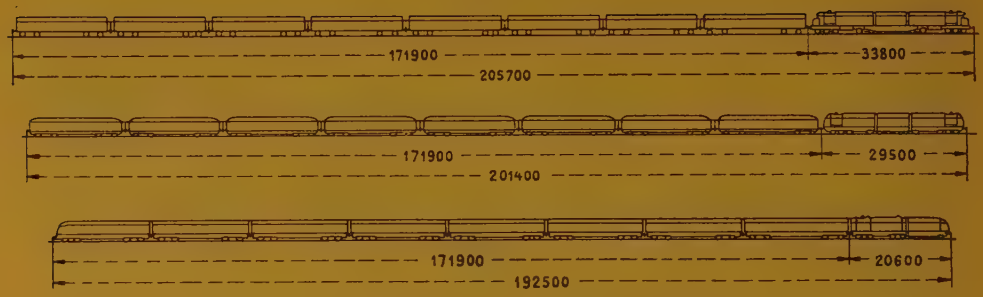
Air resistance tests.

Recent work on the measurement of air resistance with streamlined trains has been published in the *Transactions* of the American Society of Mechanical Engineers for September, 1932. The tests were carried out with models in a wind tunnel, and although they do not represent actual conditions in service, the results at least provide a means of comparing constructional forms. The following formula is adopted for air resistance :

$$\text{Air resistance} = c \frac{\gamma}{2g} A_1 V^2, \text{ where}$$

V = train speed in feet per second,
A_1 = projection of the cross-section of the train on a plane normal to the direction of running, in sq. feet,
c = coefficient of resistance of the train,
γ = specific gravity of the air in lb. per cu. foot,
g = acceleration due to gravity, 32.2 feet per sec. per sec.

The coefficients of air resistance were determined by experiments with models of trains of both ordinary and streamline construction, values being recorded for the locomotive alone, and for trains of varying composition. The results of these experiments must, however, be accepted with reserve for the following reasons. The eddying between the coaches and the ground could not be determined in the wind tunnel, and the influence of side wind was not investigated. The surface roughness of the walls has a great influence on measured results, although in actual service this factor will be of less importance. Mereover, on account of the scale effect it is questionable whether the coefficients obtained with small scale models can be employed with confidence in calculating the air resistance of actual trains. However, the results of the investigation cannot be directly applied to the trains shown in figure 1, since in the American tests the ends of both the locomotive and the rear coach were flat, whereas in the proposed designs it will be appreciated that good streamline forms are considered of great importance.



Type 1. — Train weight, including locomotive, 600 tons.
» 2. — » » » » 560 »
» 3. — » » » » 510 »

Fig. 2. — Express trains with Diesel-electric locomotives for a maximum speed of 80 m.p.h.

Figure 3 is reproduced from the A.S.M.E. *Transactions*, the left-hand diagram showing the coefficients of air resistance of a locomotive with trains of one to six coaches of the usual type, the right-hand diagram giving the coefficients for streamlined locomotives and trains. From this illustration the

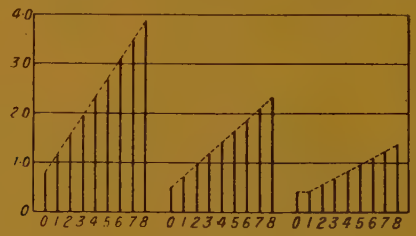


Fig. 3. — Coefficients of air-resistance, American Society of Mechanical Engineers formulæ.

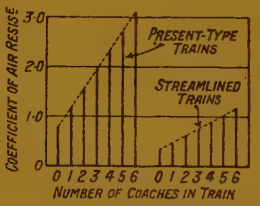


Fig. 4. — Coefficients of air-resistance for trains in figs. 1 and 2.

coefficients of air resistance for the three trains shown in figures 1 and 2 have been calculated and the results incorporated in figure 4. It will be noted that there are certain differences between the train of the first type shown, figures 1 and 2, and trains of conventional design, but the same resistance has been assumed. Figures 3 and 4 present in striking fashion the rapid increase (proportional to the square of the speed) in the air resistance with a rise in the locomotive speed. The second type train does not possess such a good shape as the American streamlined train—in the latter the connections between the coaches were smooth—and it has therefore been assumed that the resistance of a train constructed on the lines of type 2 would have a value somewhere between the air resistances of ordinary stock and the American streamlined train. As far as the third type of train is concerned, the resistance in this case would be less than for the American train owing to the improved streamline shape of the rear coach, and for this reason the air resistance of the locomotive is assumed the same as in the American tests, whilst for the train with one to eight coaches it is reduced to some extent.

Three types of train.

In order to show how the savings in power per unit weight—rendered possible by introduction of streamline con-

struction — increase with increasing speed, the weight and power required for the three trains shown in figures 1 and 2 are given in table I for speeds of 68, 80 and 93 m.p.h.

These figures show that the streamlined train has a low ratio of power per unit of weight, from which it might conceivably be concluded that, as compared with the heavier units, there would be a considerable loss of time when accelerating. That this loss is very small indeed will be seen from table II, which gives the period of acceleration for the three types of trains from start to 93 m.p.h., and the time required by each to complete the same distance run by the third train as during its period of acceleration.

TABLE I.

Train type		1	2	3
Maximum speed, 68 m. p. h.				
Train weight	tons.	360	360	360
Locomotive weight	»	177	153	120
Total weight	»	537	513	480
Diesel engine output	B.H.P.	2 600	2 100	1 700
Maximum speed, 80 m.p.h.				
Train weight	tons.	360	360	360
Locomotive weight	»	240	200	150
Total weight	»	600	560	510
Diesel engine output	B.H.P.	3 900	3 000	2 300
Maximum speed, 93 m. p. h.				
Train weight	tons.	360	360	360
Locomotive weight	»	310	250	190
Total weight	»	670	610	550
Diesel engine output	B.H.P.	5 600	4 100	3 100

TABLE II.

Train type	1	2	3
Period of acceleration . . . seconds.	375	443	520
Distance run during period of acceleration from start to 93 m.p.h... feet.	37 100	43 900	51 200
Final acceleration at 93 m.p.h. . . feet per sec. per sec.	0.06	0.06	0.06
Time for covering 51 200 feet.... sec.	478	496	520

Comparisons of different trains.

The factor which finally determines the practical value of the streamline train is economy, and from this point of view no useful purpose is served in comparing trains of ordinary design with the streamline train of the same speeds of either 68 or 93 m.p.h. For instance, at 68 m.p.h. it must at once be evident that a streamline train would not be profitable, while on the other hand at 93 m.p.h. a train of orthodox construction would hardly be a practical proposition, as will be appreciated by reference to table I. Considerations of economy will therefore be confined in the first place to comparing trains of types 1 and 3 at 80 m.p.h., and afterwards the relative merits of train type 1 at 68 m.p.h. with train type 3 at 93 m.p.h., the brief analysis demonstrating how much more

economical a streamline train is at very high speeds, and on the other hand showing that with approximately the same working expenses it is possible to raise the travelling speed some 35 % by introducing a streamline train.

A. — *Comparison of train with maximum speed of 80 m.p.h.*

The time-table for both trains is practically the same if, for long distances, the small difference in the time for acceleration be neglected. Expense of train staff over a given distance is also equal, and in both cases the locomotives run the same mileage per annum, from which it follows that amounts required for interest and depreciation per mile are in direct proportion to the initial locomotive costs. As regards rolling stock comprising the trains, the costs may be taken as equal for both sets, this assumption being based on the fact that whereas with streamline coaches extra expense would be incurred by reason of the special form of construction, yet on the other hand savings could be effected by simplifying the design of entrance vestibules and windows, the latter being so constructed that passengers could not open them while the train was in motion, thus considerably reducing the frictional air resistance along the sides of the train.

It will be seen from table I that, as far as locomotives are concerned, at 80 m.p.h. the outputs required are 2 300 B.H.P. for the streamline train and 3 900 B.H.P. for a train of type 1, the capital cost being approximately in the ratio of 1.0 to 1.5, while interest and depreciation on the locomotives would amount to about 8 %, which figure has been taken in compiling table III. These figures, which are based on an annual mileage of 90 000, do not include all working costs, but only compare those items which vary according to the type of train. Even so, the results appear to indicate that there is a saving of about £ 2 400 per annum in favour of the streamline train compared with the type 1 unit.

Table III.

Locomotive working costs in pence per mile.

Train type.	1	3
Interest and depreciation . . .	7.7	4.9
Fuel	6.2	3.1
Lubricating oil	1.1	0.6
Total. . .	15.0	8.6

B. — *Comparison of a train of ordinary construction at 68 m.p.h. with a streamline train at 93 m.p.h.*

Locomotive power to haul the ordinary train at 68 m.p.h. will, from table I, call for 2 600 B.H.P., and at 93 m.p.h. a streamline train would require 3 100 B.H.P., a comparatively small increase in view of the fact that the speed increment is over 36 %.

Considered from the point of view of capital cost, the bigger engine would involve an extra expenditure of about 10 %, although the charge for interest and depreciation, again taken at 8 %, is less per mile for the streamline locomotive. Likewise, as the staff of the high-speed train is, on a mileage basis, better utilised, wage charges—assumed at the rate of 17sh. 6d. per day—are accordingly lower. The figures in table IV are based on a daily run of 280 miles for the ordinary train and 320 miles for the high-speed train, the price of fuel oil being taken, as in the previous table, at 70sh. per ton, which is a conservative figure.

Table IV.

Locomotive working costs in pence per mile.

Train type.		1	3
Speed	m.p.h.	68	93
Wages		0.8	0.6
Interest and depreciation . . .		6.3	5.4
Fuel		4.6	3.7
Lubricating oil		0.9	0.6
Total. . .		12.6	10.3

Conclusions.

It would therefore appear that in spite of the considerable increase in speed, service with the streamline train is cheaper, as also would be the cost of maintenance of the Diesel engine per mile. It is probable, however, that maintenance of the running gear for both locomotive and coaches would increase with the higher speed, so that bearing this fact in mind, it appears reasonable to assume that the total costs for the two trains compared will be about the same. The use of the Diesel locomotive in conjunction with streamlining may thus open up the way to considerably faster running without increasing working charges, and at the same time the capital cost of the prime mover, due to reduction in power as a result of streamlining, will be definitely lower than for a locomotive with a train of conventional construction, and it is probable that a greater annual mileage will be possible with the high-speed train.

[621 .43]

A successful hydraulic drive.

The Voith-Sinclair turbo-converter.

(Diesel Railway Traction, supplement to *The Railway Gazette.)*

As a result of the performances put up by the Flying Hamburger, the German State Railways last year ordered two further vehicles, one of which was intended to run in conjunction with the original unit, and the other to operate on various other services. In the meantime, experiments made by the Maybach Motorenbau had shown that by supercharging it was possible to increase considerably the output of their 12-cylinder V-type 410-B.H.P. engine, and the engines fitted to the latest cars are provided with a turbo-supercharger which enables an output of 600 B.H.P. to be continuously maintained without increasing the former speed of 1 400 r.p.m. The weight of the engine with supercharger is 5 300 lb., or 8.85 lb. per B.H.P., compared with the 9.25 lb. per B.H.P. of the 410-B.H.P. unit.

Hydraulic transmission.

The main point of difference, however, between the Flying Hamburger and the new cars is that electric transmission has been given up in favour of the Voith turbo-hydraulic drive, which has shown excellent performance on over 60 Austro-Daimler petrol railcars, working mostly in Austria and Poland. The arrangement of the drive of the two 1 200-B.H.P. cars is shown in figure 1. This system has been developed and is constructed by the J. M. Voith Maschinenfabrik, of Heidenheim, Germany, and the manufacturing and selling rights for the British Empire have been acquired by the Hydraulic Coupling & Engineering Co. Ltd., of Isleworth, and the units installed under this agreement will be known as Voith-Sinclair turbo-converters. We understand that, conversely, the J. M. Voith Maschinenfabrik has acquired the German and Austrian rights of the Vulcan-Sinclair hydraulic coupling, described in *The Railway Gazette* for March 25, 1932 (1), which is now well known in a wide

(1) See also *Bulletin of Railway Congress,* March 1934, p. 144.

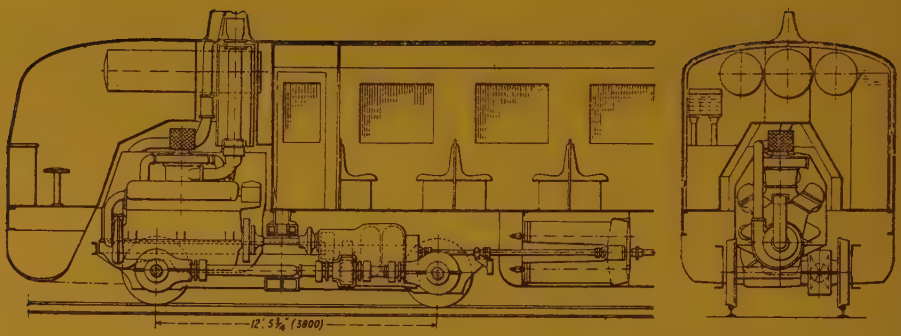


Fig. 1. — Front end of new Flying Hamburger railcar showing 600-B.H.P. supercharged Maybach engine and Voith hydraulic turbo-converter.

range of traction and industrial applications.

It was with a view to meeting the demand for a light and economical infinitely-variable transmission gear that the Voith turbo-converter was developed for railway work. It is claimed that the flexibility is equal to that of electric transmission, and as with that drive, the speed of the driving axle varies automatically to correspond with the load imposed by the train weight and the gradient. Up to two-thirds of the maximum road speed, the efficiency of the Voith-Sinclair turbo-converter corresponds generally to that of electric transmission, but above that speed the drive is direct, and the efficiency rises to a maximum of 98.5 %. The weight is lighter than that of electric transmission, and in service the reliability has been proved to be of a high order, which is understandable in view of the fact that with the exception of the ball and roller bearings there are no parts in mechanical contact. As may be seen from the accompanying drawing, the Voith-Sinclair turbo-converter consists of two separate elements : the converter, for use at starting and climbing; and the coupling for working on the level and on slight gradients.

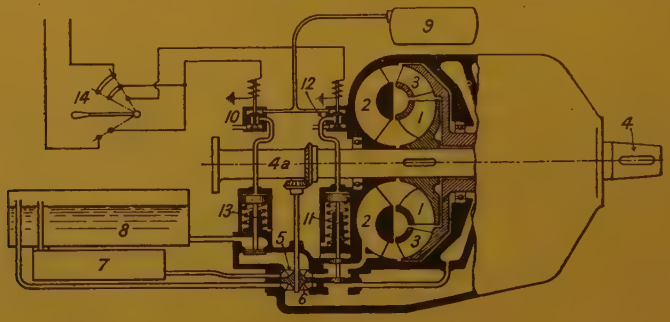


Fig. 2. — Diagrammatic layout of Voith-Sinclair turbo-converter.

The converter, or primary portion 1, in figure 2, converts the engine torque into the higher torque required by the driven shaft when running at reduced

speed. The coupling, or secondary portion 3 connects the engine directly with the final shaft 4, but with both connections the power is transmitted by the kinetic energy of the liquid circulating between the primary and secondary members. When both the working circuits are empty, the engine and driving axle are disconnected, and coasting takes place without the addition of any mechanical device, the liquid during this period being stored in the oil tank 8.

A small centrifugal pump 6, in the converter sump, and driven from the primary shaft 4*a*, delivers the liquid to a control valve 11 which feeds it either to the converter or the coupling. From both units the liquid can drain off to the sump, so that they empty as the control valve is operated to stop the feed. A second set of impeller blading 5 on the pump returns the liquid from the sump to the tank, and the cooler 7 is located in the return pipe line.

Changing over from the converter to the coupling can be effected either automatically or at the will of the driver. In the latter case the actual change-over operation is carried out by electric remote control 14, which may easily be arranged from a cab on another railcar, and multiple-unit operation is thus quite practicable with the Voith-Sinclair turbo-converter. Any number of engines on the same train can be engaged or disconnected during running in any sequence, and the majority of vehicles now in working with Voith drive have two engines running in parallel. As only two definite end positions of the control-valve are required, the electric control is very simple.

The driving cab contains the engine throttle or fuel control, which is independent of the turbo-converter, and also the control switch which, with electrical control of forward and reverse gears, engages the desired direction gear, and the converter or coupling. Fast driving being necessary only in the respective forward direction of each driver's cab, the converter alone is connected with the reverse gear when the control is set to « reverse ». In the neutral position, a stop valve 13 between the tank and feed pump is closed, so that both working circuits are emptied for coasting. The control is worked by electro-pneumatic valves 10 and 12 fed from the reservoir 9. A detailed arrangement of the Voith-Sinclair turbo-converter, as applied to a railcar powered by a 90-B.H.P. petrol engine, is shown in figure 3, the application in question consisting of two engines and two transmission systems connected in parallel.

Characteristics of the turbo-converter.

In figure 4 the torque and efficiency curves are plotted on the basis of the speed of the secondary shaft. If, when driving through the converter, the engine speed is reduced, the secondary speed is thereby decreased in the same proportion, and the primary and secondary torques will decrease with the square of the speed, the efficiency remaining constant. When driving through the coupling, the secondary torque is, of course, equal to that of the engine. As the torque of internal-combustion engines reaches its maximum value at about half the normal maximum speed, the rising torque characteristic is felt when the engine speed is brought down due to changing over from the converter to the coupling while the road speed is about two-thirds of the maximum. The secondary speed at which this changing over should be done is given by the point of intersection of the secondary torque curve of the converter, with the torque curve of the coupling. It will be seen that when driving through the coupling at above two-thirds of full speed the transmission efficiency rises to almost the 100 % value.

With light railcars on generally level lines, about 90 % of the mileage is covered with the direct drive in operation,

and the time during which the turbo-converter is in service at the higher torque multiplications is short. Taking an average efficiency of 97 % for the coupling and 80 % for the turbo-converter,

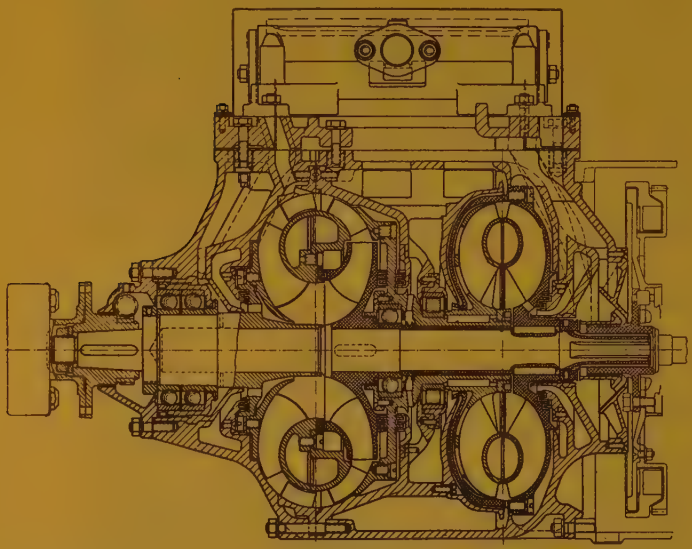


Fig. 3. — General arrangement of Voith-Sinclair turbo-converter as used in conjunction with 90-B.H.P. engine.

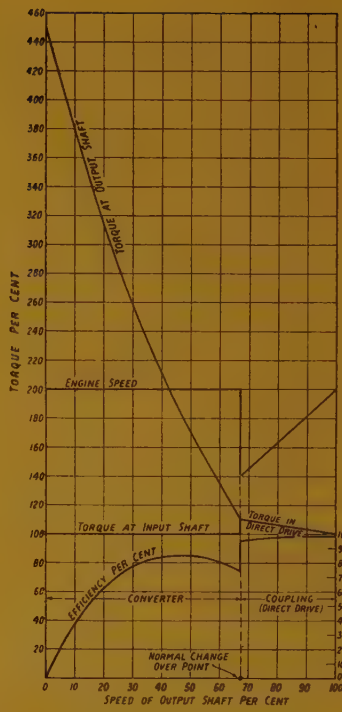


Fig. 4. — Torque and efficiency c
Voith-Sinclair turbo-converte

the mean efficiency of the drive throughout an average run will be 95.3 %. It is on this account that only a very small cooler is provided, and that the turbo-converter has given such good results where the older forms of full hydraulic transmission have failed.

Driving operations.

After starting the engine and setting it to idling speed, the transmission control switch is moved from the neutral to the converter position, and as soon as the brakes are released the vehicle starts and accelerates in proportion to the opening of the engine fuel valve, and the resultant speed of the engine. On attaining about two-thirds of the top speed, the control switch is passed to « coupling », the fuel control remaining unchanged. No danger or difficulty is caused by changing over at a speed differing from the theoretically correct one, and, of course, the car can be propelled at reduced power and speed through the turbo coupling. When starting on a gradient upon which an advantageous change-over speed cannot be reached, the turbo-converter is used until the gradient is passed, and, *vice-versa,* when driving through the coupling and a heavy gradient is reached which slows down the car, the turbo-converter may be switched in without throttling the fuel.

With those engines in which each position of the fuel control corresponds to a definite engine speed, the speed of the vehicle when driving through the coupling can be exactly adjusted by the position of the fuel lever as long as the motor

can develop a power in excess of the resistance of the vehicle. Thus it is possible to drive through the coupling also at speeds below the change-over speed as long as with full fuel the motor is able to maintain the desired speed. This case often happens when approaching a stop signal. For speedy acceleration after the right of way has been given, the converter is used until the change-over speed is reached.

When driving through the converter the speed of the vehicle will automatically correspond to its resistance. There is thus not a definite relation between the road speed and the position of the fuel control, but in this case also the highest vehicle speed is naturally reached at the highest engine speed. When no power is required the control switch is brought to the neutral position and the fuel lever to idling. The vehicle will be disconnected from the engine, the turbo-converter acting thereby as a coasting device.

From the coasting condition it is possible to pass, at will, to coupling or converter. The converter is switched in when passing from a falling gradient to a rising gradient, such that the change-over speed could not be reached by driving through the coupling. In all other cases it is possible to pass from coasting directly to coupling drive. Simultaneously with moving the switch to the coupling position the fuel control should be set for the desired speed of the vehicle, as otherwise the motor would be speeded up by the vehicle through the engagement of the coupling, and a momentary loss of vehicle speed would result.

When stopping with the converter in service, the switch is left in its position and the fuel control is set for idling. When stopping after coasting or with the coupling in service it is of advantage, when applying the brakes, to switch over to converter. Then, when re-starting, it is only necessary to release the brakes and admit fuel in order to obtain rapid acceleration.

Shunting.

When the vehicle is stopped with idling engine, the control switch should be in neutral position. The switch may then be set to the converter position of the desired direction. If a reverse gear with jaw clutches is provided for, the latter may only be engaged at standstill of the vehicle in order to prevent damaging the jaws. If friction clutches are used, engaging can be done while running, but this leads to wear on the clutches.

For this reason it is recommended that vehicles which often change direction, such as shunting locomotives, should have one turbo-converter for each direction. Thus all mechanical reverse mechanisms are avoided and no harm can be done by false manœuvring. When the vehicle is running forward and the drive is suddenly reversed by filling the reverse turbo-converter, an intense braking effect is produced until the vehicle is stopped, and from that moment it accelerates with full power. Much time can thus be gained in shunting service where quick stopping and rapid acceleration is essential.

With regard to heat conditions the turbo-converter is more favourable than any other drive. Invariably, during starting, large quantities of energy must be absorbed and disposed of. In electric transmission this energy is dissipated as heat in the windings of the motors, whereas in mechanical transmission it heats the clutches; but in the hydraulic transmission the heat goes into the working liquid, which in partial hydraulic systems is easily cooled. For shunting locomotives it is only necessary to provide for a more ample cooling surface than is normal for railcar application, and there is no wear or any other inconvenience endangering the safety or reliability of the transmission.

[656. 254 (44)]

Centralised traffic control on the French State Railways between Houilles and Sartrouville (Seine-et-Oise),

by J. NETTER,

A former student at the Ecole Polytechnique.

(*Le Génie Civil.*)

The French State Railways have just put into working on the Havre line a signalling system having features absolutely new on the Continent. All the points and crossings, switch locks and signals in the Houilles and Sartrouville stations and along the section they include have been operated and controlled by the dispatcher at Saint-Lazare station.

As is known, the dispatching system (1) enables a specially trained employee known as the dispatcher or controller to follow all the train movements over a wide area and to alter, if need be, the order in which the trains are running when, owing to the working being upset, it is desirable to send away a train held at a station before a faster train but running behind time, to shunt before the usual point a slow train running late in order to avoid delaying the following trains, etc. The dispatcher has at his disposal, for this work, a two-wire telephone line on which are shunted the apparatus by which he can communicate with one or a number of the stations in the zone under his control, to the exclusion of all others, to transmit his orders to such stations and to receive from them all relative information, both as regards the way these orders have been carried out and also as to incidents of any kind likely to affect the traffic working and which his intervention in good time could minimise.

The dispatching system has given such satisfactory results that an investigation was made into the possibility of the dispatcher himself working the points and other safety appliances in the whole or part of the area under his supervision. In this way not only would the train movements be accelerated, but the number of men employed locally would be reduced considerably. For this, the dispatcher would require a power-operated box. But all signal boxes of this kind, whether mechanical, hydro-pneumatic or electric, have a radius of action of only 1 000 to 3 000 m. (1 093 to 3 280 yards), some because the transmission by rigid rods with pin joints or by fluid cannot be worked a greater distance, and others because the lengthening and multiplication of the electric lines involves the use of greater and greater lengths of multiple-wire cables.

The problem, therefore, required to be solved in an entirely new manner, based upon the use of a *single two-wire overhead line* to operate all the appliances « in the field » and to get absolute control of their position. It is not surprising that the solution known as *Centralised traffic control* should have been devised in the country where the dispatching system has been extensively used for many years, the United States

(1) The dispatching system was described in the April 16th and September 17th, 1921, issues of the *Génie Civil.* (See also *Bulletin of the Railway Congress*, November 1922 and May 1924.)

of America. The system had been used in a number of cases before being offered in France by the General Signal Company.

The principle of the system consists in making and breaking the permanent current circulating in the two-wire line for *long* and *short* periods so as to send through the wires real *trains of signals*. The number of these interruptions is always the same, but the trains differ one from the other by the order in which the long and short breaks succeed each other. They form therefore a *code*. The working of the receiving apparatus depends entirely on the position each of the longs occupies in the code to which it belongs. In order to form the particular code which will operate a certain appliance, the dispatcher merely has to throw over a small lever, the position of which in the box corresponds to that of the appliance in question and then to press a button. With codes of 14 signals, the dispatcher is thus able to operate up to 175 appliances, each fitted with its receiver-emitter or 35 groups of receiver-emitters, on each of which up to 5 appliances may depend.

Each apparatus involved, through its own receiver-emitter group, sends out automatically through the line its own characteristic code each time the apparatus (whether a lamp, a bell or other device) installed at the central control box, to check the position of the appliance on the line, gives an indication other than the actual position of this latter. The reception of the code at the central box at once removes this discordance.

When a code emitted by the central box passes through the line, all the groups of receiver-emitters concerned which are sensitive to the first signal composing the code are set in motion and continue this movement until they receive a signal not in accordance with the one needed for their movement to continue. Consequently, only the group of receiver-emitters for which the code considered is intended completes its movement and this puts into circuit the electric motor of the appliance in the field and the supply of current for feeding it, and, as a result, causes the movement intended by the dispatcher to be carried out.

The system has the following features as well :

1. The position of each appliance operated is recorded, not only at the central box but also by the receiver-emitter group on which it depends;

2. The occupation by trains of certain track-circuited sections provided with an emitter group only sends through the electric circuit particular signals which on reaching the central box there cause the position of the trains to be recorded on an illuminated diagram and on a band of paper which moves in front of the dispatcher. In this way, the dispatcher is kept informed the whole time as to the actual location of all the trains;

3. The existing electric locking between those points and signals the position of which might not be in agreement would prevent effectively any changes of position of one of these appliances, so long as such change remained incompatible with safety. On the other hand, as soon as such incompatibility disappears, the movement of the points and of the signals will take place immediately without further action by the dispatcher;

4. It is not necessary to wait until one code is through before sending another. If, for example, a shunt requires the movement of several appliances, the dispatcher has only to place the small levers in the proper position and then to press the emitter buttons in any order. The necessary codes are then sent out one after the other and then, as the appliances have functioned, the indicator signals are sent to the box and record themselves on the diagram board.

This registering gives the centralised control diagram board much greater flexibility than that of the ordinary boards with interlocked levers.

The suppression of all interlocking

levers also makes it possible to reduce the dimensions of the control machine to those of a piece of furniture the size of a piano (fig. 1) which can be operated by one of the men whilst seated and, as it requires no foundation, it can be placed anywhere. This removes the difficulty and costs involved in erecting a building of considerable size among or near to the lines, as required when ordinary power signalling is used.

In brief, the centralised traffic control system adds to the safety of the best electrically operated boxes the advan-

Figs. 1 and 2. — Centralised railway traffic control.

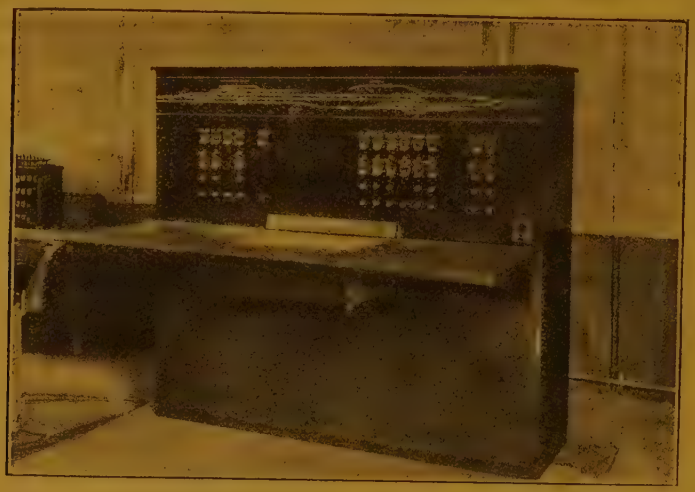


Fig. 1. — View of the control machine.

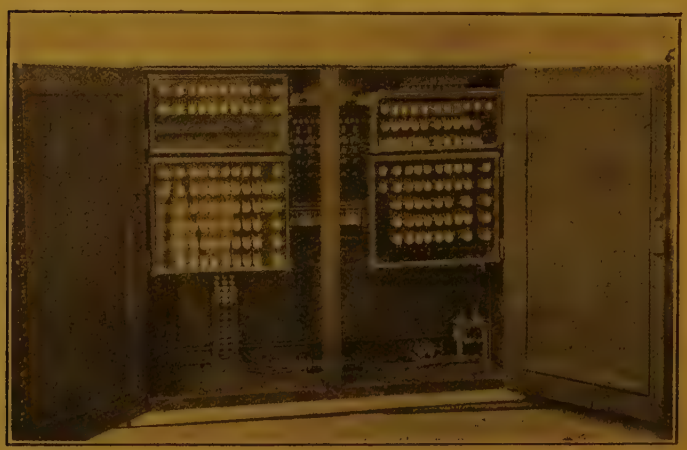


Fig. 2. — Back of the control machine with doors open.

tages of a radius of action some hundred times greater, a much greater speed of action, and the reduction to a single man of the staff employed, whether in the power boxes or in the stations and yards, for working the points and signals.

A detailed description of the way the system functions lies outside the limits of this article; we will content ourselves with a brief summary.

The diagram (fig. 3) represents a code sent to group « 256 » by the central control box, and which gives the order: « points normal » and « left hand signal

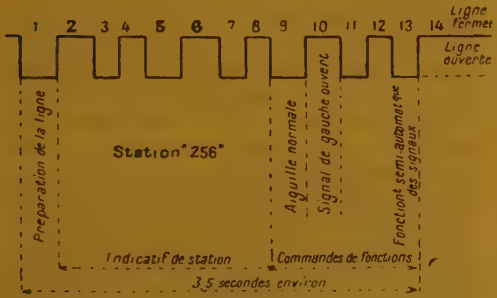


Fig. 3. — Train of control (operating) signals.

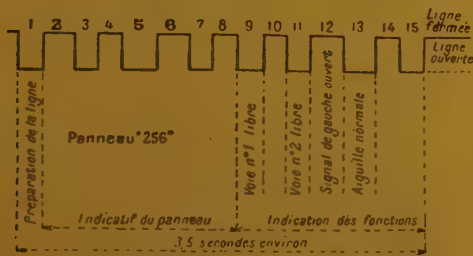


Fig. 4. — Train of indication signals.

Explication of French terms in figs. 3 and 4 :

Aiguille normale = Points in normal position. — Commandes de fonctions = Operating control. — Fonctionnement semi-automatique des signaux = Semi-automatic operation of signals. — Indicatif du panneau = Indicative number of control board. — Indicatif de station = Station indicative number. — Indicateur de fonctions = Operating indication. — Ligne fermée = Line closed. — Ligne ouverte = Line open. — Préparation de la ligne = Preparation of the line. — Signal de gauche ouvert = Left hand signal « off ». — Voie n° 1 libre = Track No. 1 clear. — 3.5 secondes environ = 3 1/2 seconds approx.

off » to the points and signals depending upon this group. The indication given to the group, viz. « 256 » means that it answers to the code in which the signals or impulses No. 2, No. 5 and No. 6 are long. All the other groups have also indicative numbers of three figures selected between 2 and 8. A simple calculation of combinations shows that there are 35 different indicative numbers available, so that 35 groups can be selected. In an operating or control code, there are always three impulses and only three of the impulses from 2 to 8 are long. Impulse 1 is always short; as to impulses 9 to 14, they are long or short according to the nature of the order it is wished to transmit to the appliances dependent on the group.

Figure 4 represents an indication code sent by group « 256 » to the central control box. In this case, the indicative number « 256 » is used to select on the control board the control lamps corresponding to the appliances of the group « 256 ». Impulse No. 1 is long; as regards 9 to 16, they are long or short according to the nature of the control signals transmitted. The time taken for the complete transmission of a code is about three and a half seconds.

These codes are emitted and received either by the group of the central control or by the groups down the line by means of a repeating relay R and a transmitting relay T. Figure 5 shows how these relays are connected to the line. All the R relays are in series on the line. When the line current is interrupted according to the rhythm of a code, the R relays of all the groups operate in synchronism. As to the T relays each has a bottom contact inserted in the line. To emit a given code a relay T is energised or de-energised in turn, according to the rhythm selected, and it makes and breaks its bottom contact and consequently completes and breaks the current in accordance.

By means of certain relays IM, NM, the contacts of which are shown in fi-

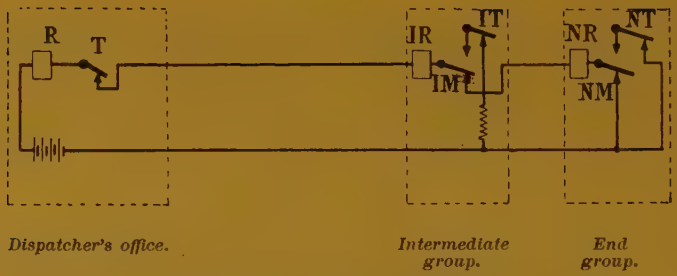


Fig. 5. — Line circuit diagram.

gure 5, provision is made for only one single T relay to be connected to the line at any moment and consequently only one code is emitted at a time. By arranging the circuits in a certain way, priority is also given to the control or operating codes over the indication codes and amongst these latter the groups nearest the post have priority.

The appliances operating the relays IT and NT, to compose the codes, also consist of relays arranged in compositor and counter groups.

These assemblies can be combined so as to form a chain which, once put in motion, operates according to long and short cycles. While a cycle lasts, the transmitter relay T is energised; during the following cycle it is de-energised and so on; when the dispatcher moves some of the short levers he sets up a certain combination between the assemblies of the central group and, at the moment he presses the emitter button, he sets in motion the cyclic functioning of the chain which causes that of the T relay in synchronism. This cyclic functioning ceases at the 14th emission.

The despatch of a control code by a group on the line is done in the same way. For reception, the same appliances are used in each group, but this time they are dependent upon the line relay R. They then work according to cycles identically the same as those of the emitter group and deliver the checking indications, following the sequence of the cycles, to registering relays which light the pilot lamps.

The principles of the system are, to some extent, similar to those of the automatic relay telephone in general use today, but include devices for checking the operation, which is much more highly developed. The only apparatus used are relays and the only moving parts are the armatures of the relays, which are fitted without pivots. The time constants required to determine the long and the short waves are obtained by a simple arrangement of the magnetic circuits of the compositor relays, without any risk of their getting out of order. The relays are enclosed in glazed and weatherproof cases, sealed up, and require no attention. The connections being outside it is possible to change any group instantly.

Application of the system between Houilles and Sartrouville.

The suburban traffic between Houilles and Sartrouville station has grown to such a volume in recent years that the State Railways were preparing a scheme for providing four tracks between these points. In the course of a recent visit to the United States the engineers of the railways, however, had their attention drawn to the rapid extension of centralised train control in that country where, thanks to the said system, several cases of doubling existing single lines had been made unnecessary. They the-

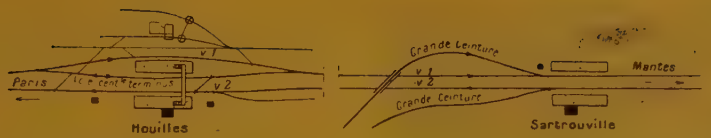


Fig. 6. — Former layout of the line between Houilles and Sartrouville.

Fig. 7. — Present layout of the line between Houilles and Sartrouville.

refore put forward, instead of the original plan for providing four lines, a new scheme involving the provision of one additional new line which would be used to maximum capacity by centralising the control of the traffic in the hands of the dispatcher at Saint-Lazare station, as this man, being fully informed as to the running of all trains on the line, was thoroughly qualified to carry out this new duty.

It was therefore decided that, at the

Fig. 8. — Sartrouville station.
View, leaving the station for Paris.
lding containing the automatic operating equipment or the station appliances is seen on the right.

Fig. 9. — Point operating mechanism.

Fig. 10. — Interior view of the Houilles box.

A, control, interlocking and operating relays of the appliances dependent on the box. — B, distribution plugs. — C, emitter-receiver groups. — D, incoming cables from the appliances dependent upon the box; connecting strips and fuses.

same time, as the automatic block was installed on the section under consideration, to add, to the *indirect* operating appliances the dispatcher had already at his disposal at Saint-Lazare station, apparatus centralising in his hands the *direct* control of the traffic between Houilles and Sartrouville.

For this purpose he had to have under his control : at Houilles, 3 points, 3 point locks and 4 signals; at Sartrouville : 13 points and 10 signals, that is 33 sets of appliances in all.

For the transmission line it was decided to use, between Paris and Asnières, two overhead wires which would be additional to the existing telephone lines.

The control machine was installed in the dispatcher's office in Saint-Lazare station beside the desk of the Paris Mantes line dispatcher who was to operate it. This employee was able to move all the levers of the panel placed on his right hand without leaving his seat. On figure 1, which shows this machine, the illuminated track occupation diagram appears at the top; below it are the small levers operating the points and those controlling the signals and below these in turn the press buttons for sending out the code. On the desk is the train graph recorder. ,

The centralised traffic control installation carried out by the General Signal Company according to the methods of the Union Switch and Signal Company, of Swissvale (U. S. A.) is today in full operation. The new equipment was put into service on the 18th September without any untoward incident.

Apart from the considerable saving in capital cost through not having to lay down and maintain a fourth track, the new equipment has made it possible to abolish three signal boxes and the staff working them.

[656. 254 (.494)]

Automatic train control in Switzerland.

The Signum inductive system adopted as standard for the Federal Railways.

(The Railway Gazette.)

For several years past the Swiss Federal Railways have been studying the advantages offered by the inductive, as opposed to the mechanical or electric system of cab signalling apparatus, and numerous trials have taken place recently for the purpose of coming to a definite decision and comparing the cost of the various equipments. Moreover, visits have been paid to other countries in order to inspect the working of the apparatus in use and to ascertain the results achieved. The Swiss Federal Railways' authorities have now come to the conclusion that the inductive system of apparatus manufactured by the Swiss firm of Signum S.A., of Wallisellen, in collaboration with the technical experts attached to the Federal Railways, is the one that presents the greatest advantages and is best suited to their requirements. Some twelve months ago a number of Signum equipments were installed at signals at intermediate stations on the Berne-Thun line, and the corresponding apparatus was attached to certain locomotives operating on this line. Extensive trials were then made which have proved entirely satisfactory.

Decision to standardise Signum train control.

At a meeting of the Administrative Board of the Federal Railways, which took place on December 1, 1933, it was unanimously decided to introduce the Signum automatic train control at distant signals on all the electrified lines of the system—a few unimportant branch lines excepted—and on all the electric railcars and locomotives. The necessary credit has been voted, and the work of equipment will occupy a period of 3 or 4 years.

In accordance with the conditions laid down by the Federal Department of Railways, the train control apparatus must, when placed at a prescribed distance from the signal at « stop », produce a rapid braking effect, at the same time sounding an alarm whistle. Should the

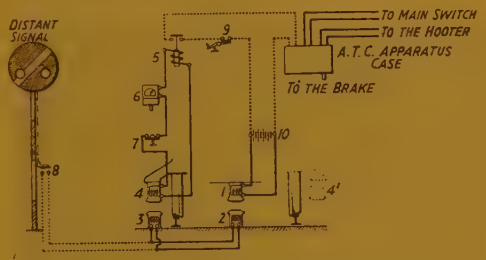


Fig. 1. — Diagram of Signum automatic train control system.

driver observe the « stop » signal in time, either directly or by seeing the relative distant signal, he will be able, by pressing a « vigilance button », to arrest the action of the automatic braking apparatus and stop his train by ordinary means. In this way all unnecessary braking and whistling are eliminated while the driver is given the opportunity of proving that he saw the stop signal in time and acted in obedience to it. Should the driver, on the other hand, neglect to press the vigilance button, the paper band on the Hasler locomotive speed recording indicator—with which all Swiss Federal electric locomotives and railcars are fitted—will register the omission, being automatically perforated when passing through the apparatus. In this way the driver will not be tempted to rely solely on the automatic safety device or be careless in his look-out. Almost immediately after passing over the track equipment, a hooter sounds in

the driver's cabin, warning him of the coming into action of the automatic braking device, in order that he may, by pressing the button, prevent rapid braking and the sounding of the alarm whistle, and bring his train to a standstill by ordinary means. Should the driver for any reason, such as sudden illness, be unable to press the button, the automatic stopping device will function soon after the sounding of the hooter and the train will be brought to a standstill by means of a rapid application of the brakes.

The apparatus does not function when the signal is at « clear ». In view of the fact that normally signals are at « clear » when a train is running to schedule time, the driver does not have to trouble about the automatic control except in special cases. In this way the pressing of the button will not become a mere habit. As it is essential that the driver should be able at all times and in all weathers to recognise the point on the line where the track equipment is placed—so that he may know when the button should be pressed if the signal be at « stop »—the apparatus is placed opposite the distant signal which it situated so far in front of the stop signal that the train will be brought to a stand automatically by a full brake application there.

The Swiss electric locomotives and railcars are already equipped with a dead man's pedal and this is now being combined with the new train control device. Just as when the dead man's pedal is released, the electric circuit is interrupted, so is the said circuit opened by means of an interrupter worked by the automatic train control device in order to cut off the main current and apply the brakes.

Fig. 2. — Track magnets at distant signal, showing contact separated by disc.

(The disc is green with white stripe; in the «caution» position it shows two green lights, at « clear » two white ones.)

The system described.

The Signum system is a combination of both magnetic and electric action and works as follows :—Four electromagnets are used to actuate the relay for interrupting the current of the dead man device. The first electro-magnet 1 is suspended from the locomotive between the wheels. This is the exciting magnet,

Fig. 3. — Locomotive approaching track m

which is permanently magnetised by the continuous current of the accumulator battery 10 of the lighting set of the locomotive. A second electro-magnet 2 is fixed in the centre of the track. Its iron core is successively magnetised and de-magnetised when the exciting magnet 1 of the locomotive passes over it. An impulse is thus produced in its winding. This impulse passes into the winding of a third electro-magnet 3 fixed to the sleepers on the outside and to the left of the track (to the left in the sense of the direction in which the train is travelling) and magnetises its core. A fourth electro-magnet 4, the receiving magnet, is fixed to the left side of the locomotive at the same distance from the centre of the track as magnet 3. Its core is magnetised and de-magnetised when it passes over magnet 3 placed on the track. A new impulse of current is then produced which operates the relay 5 interpolated in the circuit of the dead-man device. This circuit, being interrupted, brings the apparatus into action. At the same time the impulse of the current of magnet 4 drives a perforator into the speed recorder strip.

The vigilance button 7 makes it possible for the driver to interrupt the connection between the receiving magnet 4 and the train control relay 5, and in this way prevents the functioning of this relay and the perforation of the recorder strip. In order that the automatic working should not function when the signal shows « clear », the winding of the magnet placed between the rails is short-circuited by a contact maker 8 placed on the distant signal, so that current does not reach the winding of magnet 3 placed on the left of the track when the signal is « off ». The latter does not become magnetised and therefore does not affect magnet 4 on the locomotive. The contact maker 8 on the distant signal is closed when the signal is off.

Automatic safety action in case of current failure.

Should the electric wire connecting the contact maker on the distant signal break, or should the contact maker fail to function properly, the device acts as if the signal were « on ». The same principle is applied to the equipment of the locomotive, so that the automatic train control comes into action should

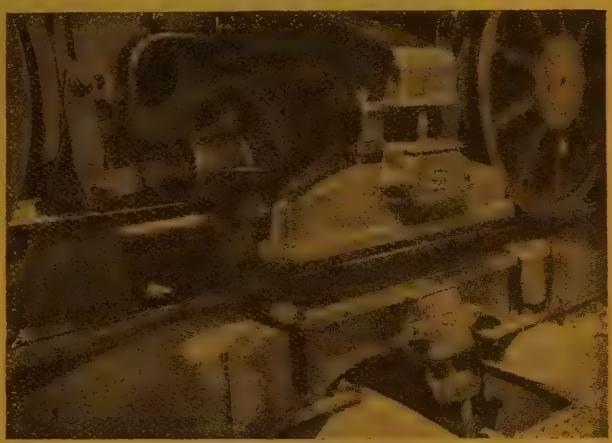


Fig. 4. — Locomotive magnet passing over a track magnet.

there be a broken wire or other defect in the circuit. This also applies to the dead-man device, which functions automatically as soon as the circuit is interrupted, whether this be a result of the driver releasing the pedal, the functioning of the A.T.C. device, or the breaking of a wire, or the failure of the battery. Figure 2 shows the two track magnets near the distant signal; figures 3 and 4 show the magnets on the locomotive and on the track at the moment of the passage of an engine. The distance between the magnet on the locomotive and that on the track is 80 mm. (3 1/8 in.) when the engine is stationary, the minimum gauge clearance.

RECENT DEVELOPMENTS
IN RAILWAY PRACTICE.

[621. 132 .3 (.42)]

New 2-8-2 express passenger locomotive for the London and North Eastern Railway.

Fig. 1.

The most powerful express passenger locomotive in the British Isles has recently been completed, to the designs of Mr. H. N. Gresley, at the Doncaster Works of the London and North Eastern Railway.

The engine is named « Cock o' the North » — a title applied originally to the Duke of Gordon.

The three cylinders are 21 inches in diameter × 26 inches stroke, and the tractive effort is 43 262 lb. Rotary cam-driven poppet valves are fitted, and a double chimmey and blast pipe is provided. The boiler pressure is 200 lb. per square inch. The grate area is 50 sq. feet and the total heating surface is 3 465 sq. feet, of which 706 feet is superheater surface. The coupled driving wheels are 6 ft. 2 in. in diameter.

The new engine is to be used to haul East Coast Route day and night express trains over the heavily graded lines between Edinburgh and Aberdeen in Scotland.

Five further engines of the same type are to be constructed at the Doncaster Works.

The engine is fitted with A.C.F.I feed water heater and pump.

Fig. 2.

A full description of this locomotive will be published in a later edition.

MISCELLANEOUS INFORMATION.

[625 .216 (.44)]

1. — Automatic couplers on French Railways.

Recent applications of Willison couplers.

(The Railway Engineer.)

The advantages of the Willison automatic coupler under widely different conditions of service are well illustrated by its applications on French railways. An interesting analysis of these applications is given in the accompanying table, based on information supplied by the « Société Financière et Industrielle de Chemins de fer », Paris, the concessionnaires of the coupler for France and the French Colonies (1).

WILLISON AUTOMATIC COUPLERS ON THE PRINCIPAL FRENCH RAILWAYS.

Railway.	Number of Willison couplings.	Applications.
Nord	710	Suburban carriages and locomotives.
P.L.M. — in France.	52	Suburban carriages and railcars.
P.L.M. — in Algiers	1 040	Wagons, locomotives and tenders.
State	6	Railcars.
Paris-Orleans	10	Railcars.
State	4	Slip carriages.
State and Phosphates de Constantine (Algiers)	30	Wagons.
Midi	234	Railcars, carriages, wagons.
Tarn	312	Locomotives, carriages, wagons.
Sud-Ouest	1 200	Locomotives, carriages, wagons.
Brazzaville	737	Locomotives, carriages, wagons.
Thiès-Niger.	60	Wagons.

Reversible trains in suburban service.

The Nord Railway of France, which adopted Willison automatic couplers in January, 1932, for the reversible trains operating on its suburban services, has now 650 couplers of this type on the passenger coaches and 60 on the locomotives engaged in these services. The construction of the couplers is shown by figure 1, the general arrangement being substantially the same as that of the couplers used on the Bengal-Nagpur and other Indian railways, with certain modifications in the design of the lock, cam and shield.

As in all Willison automatic couplers, the tractive effort and buffing impacts are taken directly by the fixed parts of the coupling, and the forces concerned are always axial or symmetrically disposed with regard to the centre line. Apart from the transition gear, which is needed only where operation in conjunction with screw couplings is required, the automatic coupler consists of only three parts — the coupler head, the lock block, and the release cam. No spring is employed. The transition device, when fitted, consists of a link coupling which can be swung up into a notch in the coupler head, so that it lies in the draft axis when it is desired to couple the vehicle to one with an ordinary draw

(1) The licensees for the British Empire are the English Steel Corporation Ltd.

hook. When the link coupling is not in use, it hangs below the Willison coupling, as shown in figure 1, and a shield closes the notch in the coupler head. The link coupling is ready for immediate use at any time without alteration or adjustment of the automatic coupler, and, whichever coupling is in use, the pull is strictly axial.

The action of the automatic coupling may be followed by reference to figure 1 and the position diagrams in figure 2. In these illustrations, *A* represents the coupler head, *B* the lock, and *C* the release cam. The throat of the coupler is flanked on one side by a jaw *D*, figure 2, and on the other by a traction lug *E*.

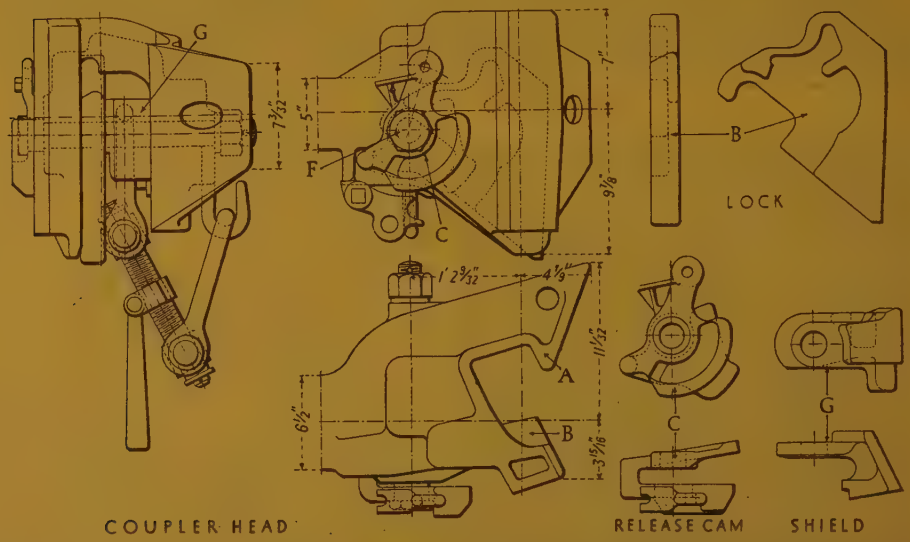


Fig. 1. — Willison automatic coupler, type Etat F, standard gauge, with screw coupling for transition service. Couplers of this type, made by the « Société Financière et Industrielle de Chemins de fer », Paris, are used on the all-steel suburban coaches of the Nord Railway, France.

The lock *B* (figure 1) rests on an inclined plane at 40° to the horiontal, and slides towards the mouth of the coupler by gravity, without the use of a spring. The cam *C*, mounted loose on the bolt F, controls the movement of the lock. A counterweight is formed on the outer part of the cam piece as shown, and a chain connected to a lever or handwheel enables the cam to be turned, thus lifting the lock and releasing the coupling.

Coupling is effected simply by running the vehicles together, whether gently or at speed is immaterial, within the limits of safety. The coupled position is shown in figure 2 (*f*) ; and

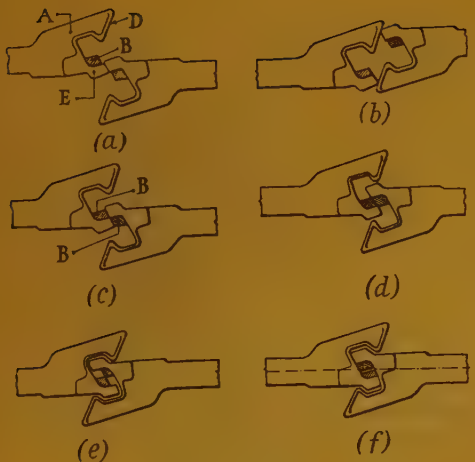


Fig. 2. — Diagrams illustrating engagement of Willison automatic couplers.

it will be seen that, whatever the position of initial impact [fig. 2 (*a*)-(*e*)], on straight track or on curves within the gathering scope of the jaws, the couplers slide automatically into engagement. The position of the locks as each traction lug enters the opposite jaw is shown by figure 2 (*e*). Immediately thereafter, the locks slide to the position shown in figure 2 (*f*) and the release cam in each coupler is turned by its counterweight so that its boss limits the movement of the lock. The shank of the coupler head is pivoted in the frame of the vehicle with a degree of freedom determined by the length of the vehicle, the gauge of the track, and the radius of curves. In exceptional cases, where narrow-gauge bogie stock is concerned the orientation of the coupler head may be controlled by the bogie, thus permitting the coupling of vehicles on curves of about 82 feet radius.

The shield *G*, figure 1, covering the opening for the link coupling, is mounted on the bolt *F*. It rises and falls as the link coupling is lifted and lowered, and it does not in any way affect the action of the automatic coupler.

Slip coach service.

The French State Railways instituted last summer slip-coach services on the Paris-Havre line. The arrangement of the slip gear employed is shown clearly by figure 3. The Willison automatic coupler *A* is used for traction, and the Robinson automatic 3-way coupler *B* for the brake and steam pipes. The stop cocks *F* and *G* in these pipes are controlled by a servo-motor *D*. An air tank *C* provides for the recharging of the auxiliary brake reservoir on the slip coach (or coaches), and also supplies the servo-motor *D*. The control box, accessible from the guard's compartment, contains the operating controls, viz., a cock *E* for admitting air to the servo-motor; a handwheel or double lever *J* actuating the uncoupling lever *H* through bevel gears, a vertical shaft, the spindle *yy'* and a chain, as shown; a cylinder *K*, ensuring that the cocks *F* and *G* are closed before uncoupling is effected; and a brake valve *L* for braking the detached coach or coaches. The interlocking pin of *K* is withdrawn automatically when *E* is opened, admitting air to the servo-motor and closing *F* and *G* by means of the shaft *xx'*. The guard can then turn the uncoupling wheel *J* and, in due course, bring the detached coaches to rest by means of the brake valve or, in emergency, by a hand brake mounted alongside the control box.

Heavy goods service.

Articulated Garratt locomotives, with 4-8-2 + 2-8-4 wheel arrangement, are used to haul heavy goods trains on the Blida-Djelfa narrow gauge line of the P.L.M. Company's Algerian system. These machines develop about 1 600 H.P. on this hilly route, corresponding to a tractive effort of about 46 300 lb. The rolling stock formerly employed, with central buffer and two side couplings, was suitable only for a tractive effort of 11 000 lb. Standard reinforced draw hooks being inapplicable, owing to the lack of space, it was decided to strengthen the frames of the wagons to suit the new locomotives, and to fit Willison automatic couplers capable of transmitting a tractive effort of 61 700 lb. In each case, the coupler is connected to the frame through an articulated tension rod and conical helical spring designed for 48 500 lb. tension or compression.

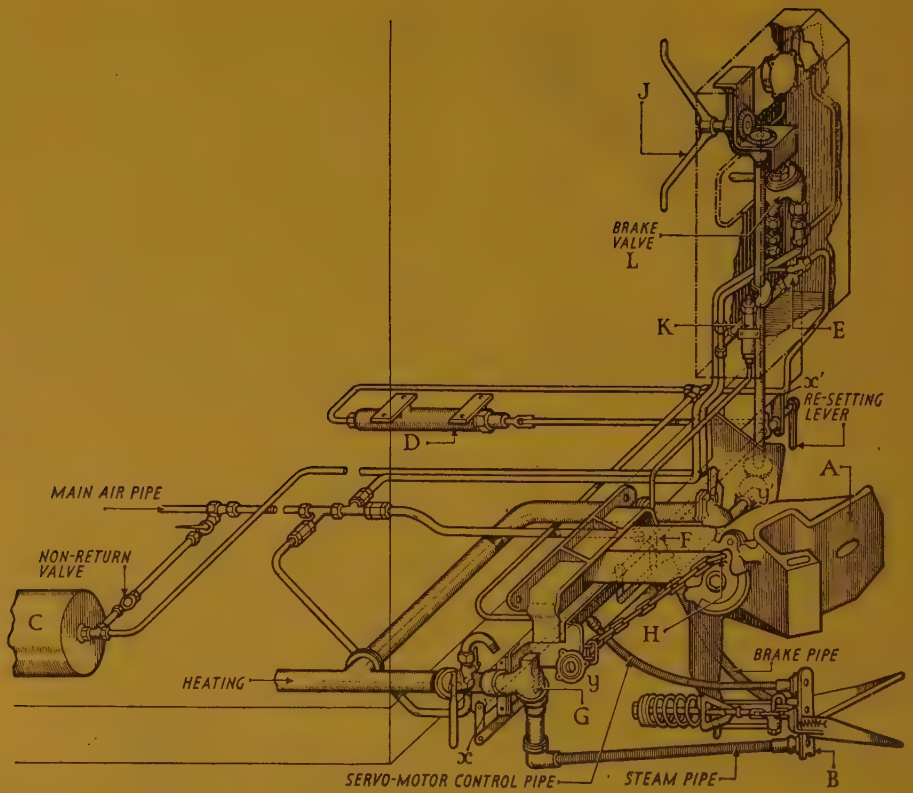


Fig. 3. — Willison automatic coupler with slip gear as used by the French State Railways.

The conversion of the rolling stock was effected in two stages. The frames were first reinforced, the strengthened wagons being then returned to service with the old drag and buffer gear untill all the vehicles were ready to be fitted with automatic couplers. The latter had necessarily to be fitted as rapidly as possible because the converted vehicles could not be used with those awaiting conversion from side to centre coupling. Thanks to the organisation of continuous working in the repair shops at Blida, 523 vehicles were fitted with the automatic couplers in five days by 100 men, a remarkably creditable performance.

Formerly, the maximum trailing load was fixed at 167 t. (164.35 Engl. tons) on this line, corresponding to the strength of the old couplings and the maximum gradient encountered; and the average coupled load was 104 t. (102.35 Engl. tons). Now, however, with the Garratt locomotives and Willison couplings, the average coupled load is 307 t. (302.15 Engl. tons) or practically three times the former value, thus effecting an important reduction in operating costs.

[621. 43 (44)]

2. — The new Diesel railcar with two motor bogies, built by Messrs. de Dietrich and Co.

(Le Génie Civil.)

Messrs. de Dietrich and Co., whose registered office is at Niederbronn (Lower Rhine), demonstrated, on the 8th September last, to the representatives of several French main line railway companies (Alsace-Lorraine, Paris-Lyons-Mediterranean, State, Nord and Est) a large railcar carried on two motor bogies (fig. 1) built at their Reichshoffen works to the requirements of the Alsace-Lorraine Railways. On this occasion this vehicle made a trial run from Paris to Bagnoles-de-l'Orne and back, over the State System, at an average speed of over 80 km. (50 miles) an hour.

In designing this car the de Dietrich Company adopted a form of construction between the ultra light or road motor type and the heavy or railway rolling stock type. The safety of the passengers on the one hand and, on the other, the reliability of the stock which, as it has to maintain a regular service, should require little maintenance in traffic, do not coincide too well when lightening of the structure is carried too far.

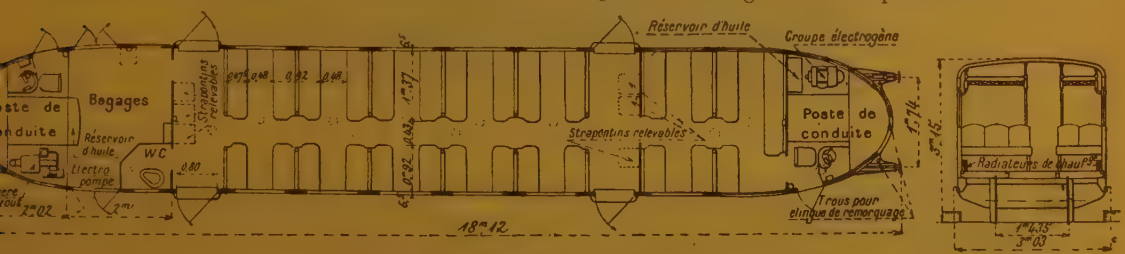
The general features and dimensions of this railcar are given in figures 2 and 3. The vehicle, which seats 75 passengers with room

Fig. 1. — View of the *de Dietrich* railcar.

for 15 standing, is able to run in either direction. It has a driver's compartment at each end and, at one end, a luggage compartment and a lavatory; it weighs 23 t. (22.6 Engl. tons) empty and 31 (30.5 Engl. tons) loaded.

The motors and transmission are carried directly on the bogie; a cover with inspection doors isolates each of the motor sets from the body. This arrangement very considerably damps out the noise and vibrations likely to inconvenience the passengers; it also faciliates the replacement of a motor bogie with all its driving gear by a spare bogie.

Bogies. — The bogies are of a special double-



Figs. 2 and 3. — Horizontal and cross sections of the railcar.

suspension type (fig. 4) with flat centre bearings lubricated on the Tecalemit system. The frame is built up of solebars substantially assembled together by the head stocks and middle bearers; these parts are all made from mild steel plate. The engine is secured to a subframe which is sprung from the bogie bolster and which can be very easily taken down in case of need.

The axles are of special chrome-molybdenum steel. S. K. F. roller bearing axle boxes are fitted. The wheels, which have steel tyres, have special centres arranged to yield elastically so that they can damp out the shocks experienced when running over rail joints and points, to transmit elastically the torque and the braking efforts, reduce flange wear and give smooth riding.

The tyres are of H steel and to the standard profile, but with the flanges reduced in thickness by 5 mm. (3/16 inch). In order to reduce the dead weight of the railcar, the thickness of the tyres has been made 40 mm. (1 9/16 inch). This thickness is permissible if we consider that these tyres carry a weight of only 3.7 tons, whereas the wheels of standard coaches carry 8 tons; the tyre wear is therefore much less. There is moreover no wear through the brake blocks, as direct braking on the tyres has been replaced by braking on brake drums mounted on the axles.

Motors. — The two motors are of the Diesel airless-injection type, made by the « Compagnie Lilloise des Moteurs »; each engine has four cylinders with opposed pistons working on the 2-stroke cycle, and developing 110 HP. at 1 500 revolutions. They are started electrically; the current is supplied at 24 volts from a 143 amp.-hour nickel-cadmium battery per engine. These batteries also supply current for lighting, the electromagnetic brake, the pump, and the fan.

Each motor is cooled by a radiator provided with a special fan the blades of which are reversible. This arrangement enables the direction of the current of air through the radiator to be made to agree with the direction the car is running. A thermostat automatically regulates the degree of cooling according to the surrounding atmosphere or the speed of the railcar.

An air compressor driven off the motor provides the compressed air required for the pneumatic control of the hydraulic brake, for the change-speed and reversing-gear boxes, the sanding gear and the whistles.

The radiators, motors, gearboxes, and exhaust silencers are carried on the bogies. The exhaust gases are discharged to atmosphere above the roof. The gas-oil tanks which hold 150 litres (33 Imp. gallons), are carried in the body close to the engines.

Fig. 4. — View of one of the bogies and its motor.

The motors can be run independently or together; in case of one of them breaking down, the other can work the car at reduced speed. The car can also be operated with one engine only when, owing to the condition of the track, the speed has to be reduced to 60 km. (37.3 miles) an hour on the level. In addition, with half load the car can be worked

with one engine, the second being brought into use on gradients.

In brief, the use of two engines results in a more flexible, cheaper, and more reliable operation, the coach being always able to return to its home depot under its own power even if one of its engines breaks down.

Change-speed gear box. — The gear box is of the synchronous type with the gears always in mesh; it has been designed especially to provide the desired strength and reliability, essential in the case of railcars for service on main line railways. It has four speeds in both directions. The gears including the reversing gear are changed by compressed air. The gear ratios are 0.19, 0.36, 0.61 and 1.

The driving axle is driven by a cardan shaft and a bevel pinion in mesh with two bevel wheels freely mounted on the axle. A dog clutch sliding in splines machined on the axle can be engaged with the dogs cut on these bevel gears. The direction of running is changed according as the dog clutch is engaged with the dogs on the right or on the left hand bevel wheel; the middle position corresponds to neutral. The reduction through the bevels is 22/49.

Body. — In order to reduce the total dead weight, the body has been built on the principle of the body side acting as a girder. The main longitudinal members are built up of steel rolled sections, the pillars and outside sheeting in high-tensile light alloy and the interior of plywood. The outside walls are sound deadened by means of felt and the floor with celotex.

The lights of *Securit* glass are frameless and are balanced by *Hera* window lifts. All handles, hand rails, and interior fittings are of brass, nickel and chromium plated. The seats are covered in leather. Luggage racks with wire nets are fitted above the seats.

The ventilation of the compartments and driving cabins is assured by torpedo ventilators which act through the reduction of pressure caused by the movement of the vehicle through the atmosphere.

The heating is by hot water; the boiler which is oil-fired is in the driving cabin on the luggage compartment side. The heating pipes run the full length of the passenger compartment on the body side just above the floor; they are covered by perforated metal covers. A pump is provided to circulate the water through the heating pipes.

Two entrance doors are fitted on each side of the body so as to reduce to a minimum the time for the passengers to enter and leave the vehicle. The interior layout makes it easy to provide accomodation for two classes of passenger, or for providing « non-smoking » or « ladies only » compartments.

Brakes and sanding gear. — The rail motor coach is fitted with :

An oil-pneumatic brake acting on drums fastened to each pair of driving wheels;

A hand brake acting on the driving pairs of wheels;

An electro-magnetic rail slipper brake the action of which, being independent of adhesion, makes it possible to apply the brake at high speeds without risk of skidding the wheels.

When running down gradients, the compression of the motors can be used for braking. Compressed air sanding for both directions of running is fitted. The simultaneous application of the oil-pneumatic and electro-magnetic brakes will stop the motor coach from a speed of 90 km. (56 miles) on the level in a distance of 100 to 150 m. (328 to 492 feet).

Performance. — During the official trials, this rail motor coach reached the following speeds :

On the level, 100 km. (62 miles) an hour in 2 min. 38 sec.;

On 1 in 200, 90 km. (56 miles) an hour in 3 min. 30 sec.;

On 1 in 100, 70 km. (43.5 miles) an hour in 2 min.;

On 1 in 66, 65 km. (40.4 miles) an hour in 2 min. 20 sec.

With one engine only driving, the rail motor coach attained on the level a speed of 75 km. (46.6 miles) an hour in 4 min. in a distance of 2.5 km. (1.55 miles).

[621. 43 (.43)]

3. — 1 000-B.H.P. directly-driven Deutz-Diesel locomotive.

(Diesel Railway Traction, supplement to *The Railway Gazette.)*

Despite the attractiveness of a direct drive between the engine and the road wheels, the inherent defects of the Diesel engine are such that only three attempts have been made to utilise this form of transmission in the 22 years' history of the oil-engined locomotive. The first two machines, the Sulzer-Diesel 2-B-2 locomotive of 1912, and the Ansaldo 2-C-1 unit of 1929, embodied two-cycle engines and thereby sacrificed a certain amount of flexibility in order to gain simplicity, and the third example of direct drive, found in the locomotive tested by the Humboldt-Deutzmotoren A.-G., which firm constructed the unit to its own designs after experimenting with a smaller machine, is also powered by a two-cycle engine. Another form of direct drive is the Kitson-Still, but in this case the Diesel cylinders are assisted by steam on the other side of the pistons at starting and during periods when great power is required.

The 2-B-2 wheel arrangement, the two-stroke engine, and the rated output of 1 000 B.H.P. of the Deutz product are the same as those of the pre-war Sulzer machine, but there the similarity of the two designs ends, for the Deutz locomotive has three double-acting cylinders arranged in the same fashion as those of a steam locomotive, in place of a central crankshaft driving four single-acting cylinders arranged in a V. The 82-ton Ansaldo locomotive was powered by a six-cylinder two-stroke opposed piston engine mounted in the cab structure, the scavenging pump cylinders, which were used for starting, taking the place of normal locomotive cylinders.

Direct drive difficulties.

One of the basic problems of the Diesel locomotive is that of developing adequate torque at low speeds. Rigid connection of the motor with the driving axles is practicable only with a working cycle which develops, by aid of the smallest possible amount of external energy, sufficient torque at low speeds to provide for starting under load, acceleration and running up hill. After several years' research work the Humboldt-Deutzmotoren A.-G. developed the Diesel engine so that it became possible to burn oil in the starting air during the first revolutions of the driving axles, without pressure-rise. Acceleration and climbing power are secured by supercharging; and the ordinary Diesel cycle with airless fuel injection suffices for running on the level. The compressed air requirements of the locomotive are thus reduced to such an extent that the dimensions of the auxiliary engine and compressor remain within reasonable limits, viz., about 20 % of the normal indicated power of the locomotive cylinders.

Early trials.

Preliminary trials of supercharging for climbing showed that it was impossible to start under load with cold, high-pressure air and change over to supercharged Diesel operation after reasonable consumption of compressed air. The repeated expansion of cold air so chilled the walls of the combustion space that high acceleration was required to ignite the injected fuel. Pre-warmed high-pressure air gave little better results, the air quickly losing most of its heat, and the subsequent expansion again resulting in such cooling that ignition could not be relied upon at low speed. Trials of various methods of warming the compressed air led to the development of a device for burning small quantities of oil in the compressed air at constant pressure and without risk of explosion. In the first instance, an electrically-heated glow-coil was used to maintain this combustion in a separate chamber, but it was soon found practicable to effect it in the engine itself.

Following upon successful trials with a stationary engine, the investigations were continued with a standard Deutz four-cylinder geared Diesel locomotive of 100 B.H.P., retaining the clutch and using the top gear. Satisfactory starting under load was obtained

Fig. 1. — Direct-drive Diesel locomotive for light passenger service.

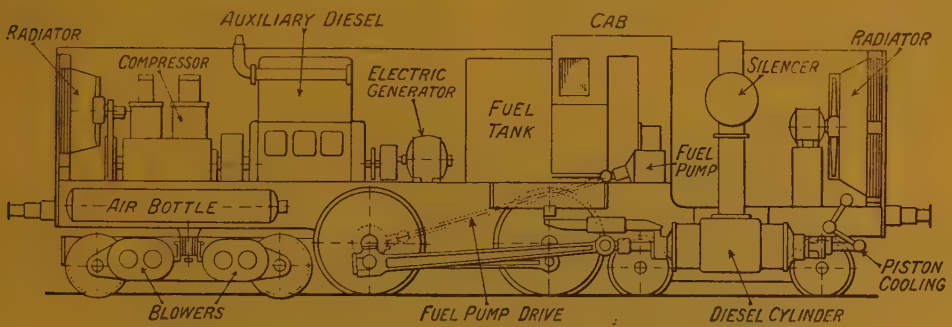


Fig. 2. — Layout of new 1 000-B.H.P. Deutz direct-drive locomotive.

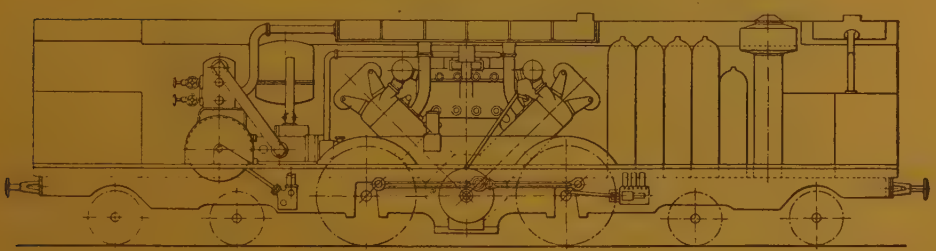


Fig. 3. — Layout of 1 000 B.H.P. Sulzer direct-drive locomotive, 1912.

and the consumption of air was quite moderate. On the other hand, the backlash of the gears accentuated the shocks resulting from irregular ignition during the starting period, and there were also shocks when coasting. The difficulties were overcome by eliminating gears and driving directly on to the axles by means of connecting rods, as in steam loco-

motives; but with this arrangement it was necessary to avoid peaks of combustion pressure, and even to decrease the normal pressure in order to reduce the stresses on the motion work.

In order to try out starting with reduced pressures and increased admission, the injection and valve gear of the 100-B.H.P. locomotive were reconstructed. In addition to the injection nozzles and pumps for ordinary Diesel working, the cylinders were fitted with a second injection device for starting at low pressure. The range of admission for air and fuel at starting was increased to 100° of crank angle, and the ratio of injected fuel to air supply was controlled to ensure regular firing. Exhaustive tests on a horizontal, double-acting, two-stroke cylinder provided the basis of design for the actual locomotive cylinders, and the construction of the experimental locomotive, which embodies buffing and draw-gear and various other standard details of the Reichsbahn, is shown by two of the accompanying illustrations

1 000 B.H.P. locomotive.

This locomotive was designed for light express duties, where about 600 D.B.H.P. is required in normal work, and the maximum speed does not exceed 68 m.p.h. The three double-acting cylinders are each 300 mm. (11 13/16 inches) diameter by 600 mm. (23 5/8 inches) stroke, the outside cylinders driving on to the crank pins of the second pair of coupled wheels, and the inclined cylinder on to the crank axle of the leading pair of drivers. The driving wheels are 1 750 mm. (5 feet 8 7/8 inches) diameter, and the locomotive weighs 78.75 tons in working order, of which total 33.5 tons are available for adhesion. At the maximum road speed the driving wheels make 333 r.p.m. This proportion is low, but it was desired to keep the axle load to a maximum of 17 metric tons. By allowing the bogie pivots a side play of 50 mm. per side, curves of 395 feet radius can be traversed. The framing is a combination of the bar and plate patterns, and by suitable designing, the stresses in the rods, crossheads, axles and cranks have been kept within the limits of modern steam practice without making the details cumbersome.

As may be seen in the diagram, the supercharging blowers for the driving cylinders are gear-driven from the axles of one bogie, the air being led through ducts to the air bottles and cylinder block. The main engine pistons are cooled by water (an unusual medium), the pump being driven through an arrangement of links connected to the piston tail rod.

Auxiliaries.

The auxiliaries are driven by a vertical three-cylinder single-acting four-stroke engine, with cylinders of 240 mm. (9 7/16 inches) diameter by 420 mm. (16 9/16 inches) stroke, which is mounted in the cab, and drives the compressor, one radiator fan, and an electric generator. Radiators for the engine circulating water and lubricating oil are arranged at each end of the locomotive, that at the end farthest from the auxiliary Diesel engine being driven by a small electric motor without the intermediary of gearing or a belt. The cab is situated near the centre of the locomotive and has controls at each side. The fuel pump and its control gear are also situated in the cab, the drive being taken from the second driving axle. Large bonnets at each end of the cab house the auxiliary apparatus, fuel tank and silencer.

The locomotive left the Deutz works in June 1933 and has since been running experimental road trials on different stretches of the German State Railways. Although various troubles have been encountered, it is understood that the results have, generally speaking, been encouraging, particularly as regards the special features connected with the starting and direct drive. From the vehicular point of view the locomotive seems to be all that could be desired, although the 4-4-4 wheel arrangement has in some instances been subject to criticism on the score of lack of stability. The trials are of considerable importance, for a successful direct-drive locomotive would probably create a much larger demand for Diesel locomotives than at present exists.

[621 .43]

4. — The Krupp hydraulic clutch applied to a 1450-B.H.P. locomotive of the Boston and Maine Railroad.

(Diesel Railway Traction, Supplement to *The Railway Gazette.)*

One of the principal problems connected with the application of gear transmission to Diesel locomotives, whether of the heavy main-line or lighter duty type, is the provision of a form of main clutch which will have a sustained slipping capacity without undue wear or heating when accelerating a heavy train, but which, when necessity arises, will be capable of rapidly and smoothly taking up the full engine torque. The Lomonossoff 1 200-B.H.P. Diesel-mechanical locomotive was originally provided with electromagnetic main and gearbox clutches, and although, for the time of construction, the results obtained were quite good, a certain amount of wear and heating took place, and the time for a complete gear change was 15 to 17 seconds, a period which could not be regarded as satisfactory for future units.

Since 1925, when the Lomonossoff locomotive was completed, much progress has been made in clutch design, and hydraulic media are now in great favour, not only for high powers, but also for small locotractors which frequently have to develop their maximum tractive effort. The Lomonossoff locomotive itself has now been fitted with an hydraulic clutch of a type similar to that about to be described, and is now understood to be giving good service.

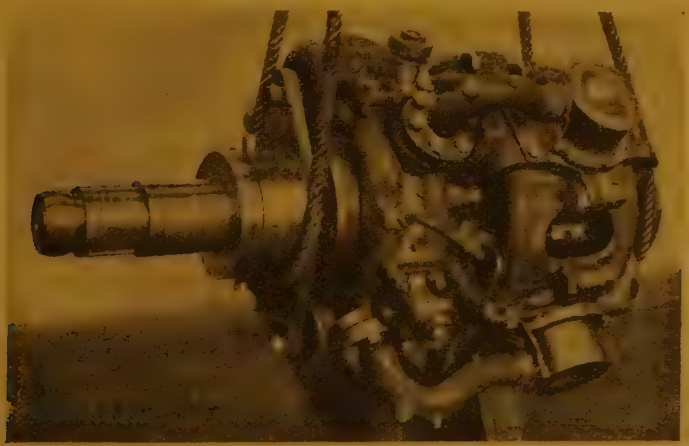


Fig. 1. — Hydraulic clutch as fitted to 1 450-B.H.P. locomotive.

For some years the Fried. Krupp A.G. has given close attention to the various features connected with the design of Diesel-mechanical locomotives, and has developed the hydraulic clutch shown in the accompanying illustrations. The unit shown in the half-tone is applied to the 1 450-B.H.P. locomotive built to the order of the Boston & Maine Railroad, but which for the past twelve months has been running on the German State Railways. The engine is supercharged, and runs at a normal speed of 470 r.p.m., the maximum tractive effort being 50 000 lb., and the road speeds 8.7, 16, 31 and 60 m.p.h. A similar design has been

incorporated in the 600-B.H.P. 1-C-1 locomotive of the Japanese Government Railways.

As may be seen from the sectional drawings presented herewith, the clutch consists essentially of a main casing with four cylinders arranged at right angles, the opposite pairs being connected by pipes, in which are located regulating valves. The casing also houses a jaw clutch and a spring coupling, and the four pistons are connected to a common crank pin. The main casing is rigidly secured to the main shaft of the Diesel engine, and the

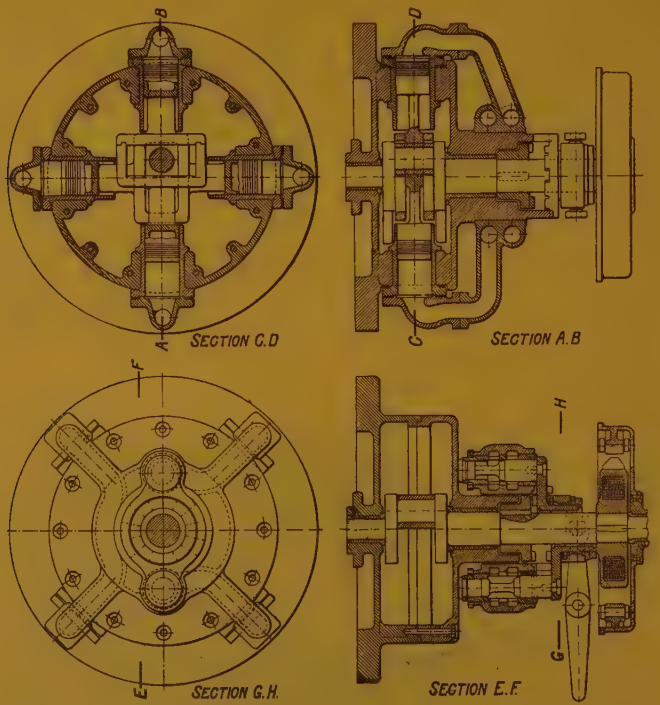


Fig. 2. — General arrangement of Krupp hydraulic clutch.

crankshaft of the clutch is connected through the spring coupling to the primary shaft of the gearbox.

In normal operation the cylinder connecting pipes are filled with the working fluid. The regulating valves are operated by a lever which also controls the jaw clutch, the latter being arranged to take the drive directly when the clutch is fully in and transmitting the whole of the engine torque, thus relieving the load on the clutch, cylinders and pistons. In the « out » position of the clutch, the working fluid circulates through the interconnecting pipes, and there is no movement of the clutch countershaft. When the valves are closed, or partly closed, a resistance is opposed to the passage of the fluid, the amount of the resistance determining the slippage and torque transmission. Operating experience has proved that the capacity of the clutch can be evenly regulated from full open to full in without shocks.

[621. 39 (.485) & 625. 234 (.485)]

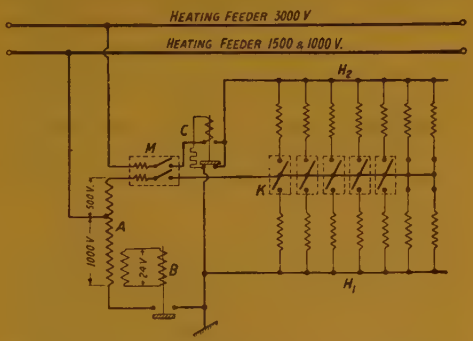
5. — Electric heating of railway carriages for international trains.

(Electric Railway Traction, Supplement to *The Railway Gazette.)*

The heating of main-line coaches used in long-distance international traffic, or circulating throughout five or six countries, as is the practice in Europe, presents certain difficulties, for the vehicles must not only be fitted with steam heaters, but also with electric apparatus suitable for operation over various electrified systems which have not the same type of current or voltage.

On d. c. lines the heating apparatus usually operates at the contact line pressure, and as there are a number of d.c. systems working at 1 500 volts, apparatus working at this tension is commonly found on the Continent. Within recent years a number of d.c. electrifications have been carried out or planned, *e. g.*, in Italy and Poland, at a pressure of 3 000 volts and heating apparatus to suit this current will be one of the requirements of the future. Most of the single-phase railways employ that type of current at 1 000 volts for the heating equipment of the rolling stock, and the systems at present used for connecting the 1 000 a.c. and 1 500-volt d.c. heating circuits are none too simple, and the re-connection is carried out by hand. With the possibility of yet another voltage, it is obvious that there is room for a scheme which will not only be capable of dealing with the three different heating systems, but which will also possess the feature of automatic re-connection to the correct voltage.

With these ends in view, Mr. Ivan Ofverholm, the Chief Electrical Engineer of the Swedish State Railways, has evolved a plan in which each coach is fitted with two through-running heating feeders, one for 3 000 volts and the other for 1 000-1 500 volts, as may be seen from the accompanying wiring diagram. The low-voltage line will be arranged down the underframe, as at present, but the high-tension feeder will be laid along the roof. The heaters are dimensioned to suit a tension of 1 500 volts, but half of the heaters, H_2 in the diagram, are insulated in such a way that



Wiring diagram of Ofverholm train-lighting system for international carriages.

when connected in series with the other half, H_1, they can withstand a voltage to earth of 3 000.

Automatic adjustment.

To permit of an automatic change-over from 1 000 to 1 500 volts, there is incorporated an auto-transformer, A, with an auxiliary winding which is connected to the solenoid of an automatic switch, B. If the feeder is on 1 000 volts a.c., the auto-transformer becomes magnetised by a current led through the 500-volt winding, which is permanently connected in series to a few of the heaters. The solenoid of switch B then receives current and the transformer earth circuit is closed. By means of the step-up transformation the two groups of heaters are supplied with a voltage of 1 500 and are connected in parallel to earth. If the feeder voltage is below 1 000, the voltage in the heaters is proportionately less than 1 500, and the heating effect correspondingly lower.

Where the feeder is alive at 1 500 volts d.c., the transformer does not function as such, and as the solenoid of switch B does not receive current, the earth connection is not made, and the heaters receive current direct at 1 500 volts through the 500-volt winding of the transform-

er. With 3 000 volts on the feeder, the change-over switch, C, automatically connects the heaters in series at 3 000 volts by means of a solenoid connected direct, or through a resistance to the high-tension supply. The common connection, K, of the two heater groups, is permanently connected, through an over-current breaker, to one end of the transformer winding, and thus to the low-tension heating feeder. As the connection between 1 000 and 1 500 volts can be effected by a simple relay and low-tension operating coil, it can be made fully automatic under all conditions, although hand operation can be fitted in addition.

There is a possibility of the solenoid of the switch B, if connected up as shown in the diagram, being momentarily magnetised, and closing the contact when the feeder is taking d.c., thus earthing the feeder, and to prevent such an occurrence the switch can be given time-lag, or an auxiliary relay may be incorporated.

Since the insulation of the feders hitherto used for 1 000 and 1 500 volts does not permit a tension of 3 000 volts being applied without precautions being taken, and since the various connections are not designed for so high a voltage, such an arrangement with two feeders can probably be considered as the most suitable solution. The new 3 000-volt feeder would be provided with considerably heavier insulation than that now internationally used for 1 500 volts. Should it be a question of employing a common feeder, due to which the already installed feeder in coaches in service must be reinforced, then the system can easily be adapted for the purpose. Resort can be had to relatively simple change-over switches or relay combinations which can be arranged according to different methods and wiring principles already well known. We are indebted for much of the foregoing information to the *Asea Journal*, published by the Swedish General Electric Company.

NEW BOOKS AND PUBLICATIONS.

[388. 63]

List of stations on the railways to which the International Convention of the 23rd October 1924, on the carriage of goods by railway (C. I. M.) applies. — 1 vol. (10 1/2 × 8 inches) of XXXIX + 360 pages. — 1932, Berne. — Published by the HEADQUARTERS OFFICES FOR THE INTERNATIONAL CARRIAGE OF GOODS TRAFFIC BY RAILWAY, at Berne.

The International Convention on the carriage of goods (C.I.M.), the text of which was drawn up and approved originally in 1890, very greatly improved the commercial relations between the continental countries, by bringing international traffic under a single set of regulations. Its application is limited to the railways of those countries which have accepted it and its application is greatly facilitated by the publication of the list of the stations of the said railways.

The Headquarters Office for International Railway Traffic, located at Berne, is responsible for carrying out the Convention and has taken great pains in revising this new issue (the 7th) of the list of stations, which had become necessary, as much of the information given was no longer correct, largely through new countries having joined.

As before, the stations are given in alphabetical order, and the name is followed by that of the country, and of the railway, and by figures, letters or signs defining the conditions governing the consigning of goods.

E. M.

[669. 1]

LAFFARGUE (Marcel), Mining Engineer. — **Fabrication de l'acier au convertisseur basique. Scorie Thomas** (*The manufacturing of steel by the Thomas* [*basic*] *converter. Basic slag*). — 1 vol. in-octavo, square, 157 pages and 30 figures in the text. — 1933, Liége, Librairie Polytechnique Ch. Béranger, 1, Quai de la Grande-Bretagne. (Price : 52.50 Belgian francs.)

Thomas steel is based on chemical reactions taking place in large masses, with the release and exchange of heat in great quantities. These phenomena are effected by the composition of the pig iron and the loads and characteristics of the blast and should, however, result in products of given quality and at temperatures laid down to within a few degrees. To get this result necessitates the intervention of the steel makers as the result of observations during the work and carried out rapidly, as it is still a particular feature of the steel works that conversion of the steel starting from the pig iron takes place in a very short time.

Mr. Laffargue, in the preface to his book, states that he deals essentially with current practice in it, and the book does in fact meet this definition, if by that we understand that the reader can find therein all the information he may need on the physical and chemical phenomena the steel works engineer is called upon to observe every day. Amongst the information given will be found much numerical data which we need to understand and control the successive transformations which take place in the materials used.

The technological description of the machinery has been deliberated left aside, as descriptions of it can be found so easily. The same remark applies to the organisation of the gangs in the works as this depends upon the special conditions at the works and on the scale of production. On the other hand, everything dealing with steel making properly speaking has been reviewed from the theory of basic conversion to the making of the ingot, not forgetting the essential equipment such as the converter, the ladle, and the ingot moulds.

An analysis of the factors affecting

production and production costs provides us with the means whereby to appreciate from these two aspects the working of the steel works.

The second part of the work deals with the Thomas (basic) slags, their composition and properties, the machines for working them and the influence the running of the steel works has on their qualities and their value in use.

E. M.

[656. 225]

The Container, *Bulletin of the International Container Bureau,* founded under the auspices of the International Chamber of Commerce, 38, Cours Albert I^er^, Paris. Number 1, January 1934 (first year of publication).

Though born but yesterday, the *container* has already become part of the normal practice of several railways. The leading constructional details have been fixed to allow of its use in international traffic : shape, overall gauge, dimensions (by classes), strength, method of carrying, equipment for loading them, etc. The rates have been adjusted to suit this new tool, and steps taken to deal with them when passing through the customs. In America special stations at which containers are sorted out as to destinations are already in existence.

This rapid evolution of a new application is symptomatic and reveals its value. The container gives us door to door transport. The body of the wagon has become moveable and, in addition, can be sectioned into several parts easy to handle, which are taken to the customer to collect or deliver the goods, and are conveyed either by rail, or by road, or are sent oversea on the deck of a ship.

There was the danger of very different designs of containers being made to suit the standards of the different countries, as this would have compromised the results: this was appreciated by the promotors of the International Container Bureau, set up the 22nd February, 1933, and whose object, as shown by the statistics published *in fine* in the first number of its *Bulletin* is to take or suggest, « in a general manner, all measures which may assure the growth of container traffic » and whose first object is « to effect as soon as possible the standardisation of the types of containers for use in international traffic and also, if necessary, of the types of containers utilised in internal traffic ». We will limit ourselves to these two quotations.

This publication shows by means of numerous photographs the extended use of this new method of transport. It quotes the opinions of many well-known authorities, describes the arrangements and apparatus used in handling container traffic, and gives articles on the construction of containers and publishes letters from its correspondents.

In the final section entitled: « The work of the International Container Bureau since its foundation » valuable information will be found about the constitution of the Organisation, on the decisions already arrived at and the working methods adopted. Two Commissions share the work : one is a technical commission and the other a commercial commission. In addition to the text of the rules and regulations, the *Bulletin* contains, as appendices, « the technical conditions for the admission of containers into international traffic » with drawings of the loading gauges allowed, and the conditions to be complied with in order to pass the customs.

The creation of the *International Bureau,* the first measures and decisions which it has arrived at, and the publication of its *Bulletin* certainly mark a stage in the progress of transport and in the collaboration between railway and road, a collaboration which was the guiding principle of the Organising Committee.

E. M.

MONTHLY BIBLIOGRAPHY OF RAILWAYS [1].

PUBLISHED UNDER THE SUPERVISION OF

P. GHILAIN,

General Secretary of the Permanent Commission of the International Railway Congress Association.

JANUARY (1934)

016. 385. (02]

I. — BOOKS.

In French.

33 **385. (08**

nuaire 1933-34 de la Chambre Syndicale des Fabri-s et des Constructeurs de matériel pour chemins er et tramways.

ris (8e), édité par la dite Chambre syndicale, 7, rue Madrid. 1 volume (13.5×21.5), 344 pages. (Prix : ancs français.)

33 **385. (09.1 (.4)**

las complétant la carte des chemins de fer de ope.

ris, Union Internationale des Chemins de fer. 1 fas-e (19×27), 11 planches.

33 **721. (02**

AMUS (E.) et COUDERC (J.).

genda du bâtiment.

ris, Dunod, 92, rue Bonaparte. 1 volume (10×15), pages et 67 figures. (Prix: 20 francs français.)

33 **669. (02**

AUD (R.).

genda de métallurgie.

ris, Dunod, 92, rue Bonaparte. 1 volume (10×15), pages et 54 figures. (Prix: 20 francs français.)

33 **621 .114**

MPSAUR (N.).

héorie du graissage. Théorie, machines, huiles, is.

ris (Ve), Delagrave, 15, rue Soufflot, 1 volume ×25), 53 figures. (Prix : 30 francs français.)

33 **621 .3**

VALLIER (H.).

urs pratique d'électricité industrielle à l'usage des essionnels et des élèves des écoles d'enseignement nique.

me III: Applications des courants électriques, rage, chauffage, force motrice, électrochimie, télé-hie, téléphonie.

aris, Ch. Béranger. 1 volume, 432 pages et 443 fi-s. (Prix: 60 francs français.)

1933 **62. (01**

DREYFUSS (E.).

Leçons sur la théorie de l'élasticité et ses relations avec la résistance des matériaux.

Paris, Léon Eyrolles. 1 volume (16.5×25), 195 pages et 49 figures. (Prix: 20 francs français.)

1933 **691. (02**

FORESTIER (V.).

Agenda du béton.

Paris, Dunod, 92, rue Bonaparte. 1 volume (10×15), 365 pages et 24 figures. (Prix: 20 francs français.)

1933 **624 .9**

GELBLUM (A.).

Charpentes rationnelles les plus économiques. Bâtiments industriels en acier.

Paris (6e), Dunod, 92, rue Bonaparte. 1 volume (16×25), 324 pages, 323 figures et 16 planches. (Prix : 125 francs français.)

1933 **621 .392**

GROS (Ch.).

Traité complet de soudage aux soudures fortes et aux soudures d'étain.

Paris (6e), Desforges, Girardot et Cie, 27 et 29, quai des Grands-Augustins. 1 volume, 115 pages et 123 figures. (Prix: 10 francs français.)

1933 **531**

HARNET (O.) et VERCLEYEN.

Cours de mécanique générale. 3e partie : Dynamique.

Paris, Ch. Béranger, 15, rue des Saints-Pères, et Liége, 1, quai de la Grande-Bretagne. 1 volume, 203 pages, 131 figures. (Prix: 12 francs français.)

1933 **385. (07**

Instructions pour l'exécution des dessins techniques. A l'usage des grands réseaux des chemins de fer français.

Paris, Ch. Béranger, 15, rue des Saints-Pères, et Liége, 1, quai de la Grande-Bretagne. 1 volume (15×22), 66 pages et 37 figures. (Prix: 22 francs français.)

(1) The numbers placed over the title of each book are those of the decimal classification proposed by the Railway Congress jointly with the Office Bibliographique International, of Brussels. (See « Bibliographical Decimal Classification as applied to lway Science », by L. WEISSENBRUCH, in the number for November 1897, of the *Bulletin of the International Railway Congress*, 1509).

1933 621. (02

IZART (G.).

Agenda de construction mécanique.

Paris, Dunod, 92, rue Bonaparte. 1 volume (10×15), 440 pages et 136 figures. (Prix: 20 francs français.)

1933 62. (02

Agenda Béranger pour 1934.

Paris, Ch. Béranger, 15, rue des Saints-Pères, et Liége, 1, quai de la Grande-Bretagne. 1 volume (9×14), 362 pages. (Prix: 16 francs français.)

1933 625 .13 (.493)

Les tunnels sous l'Escaut, à Anvers.

Liége, La Technique des Travaux, 196, rue Grétry. 1 volume, 72 pages, 66 fig. (Prix: 15 francs belges).

1933 625 .213

L'industrie ferroviaire et le caoutchouc.

Paris, Sté Dunlop, 64, rue de Lisbonne. 1 plaquette (24×35), 45 pages et figures.

1933 621, 624, 656 & 691

MASSOTTE (E.).

Carnet des travaux publics et du bâtiment.

Fascicule I. — **Formulaire des poutres droites, des cadres et des arcs maçonneries.**

Fascicule II. — **Le béton armé.**

Fascicule III. — **Charpente en bois et métallique. Couverture.**

Fascicule IV. — **Fondations et mécanique.**

Fascicule VI. — **Voies de communications terrestres. Routes et voies ferrées.**

Paris, Ch. Béranger, 15, rue des Saints-Pères, et Liége, 1, quai de la Grande-Bretagne.

Fascicule I: 197 figures et tableaux;
— II: 57 — —
— III: 126 — —
— IV: 116 — —
— VI: 113 — —

(Prix: 30 francs français chacun.)

1933 669 .1

METZ (N.).

Le laminage du fer à chaud et le tracé des cannelures des cylindres de laminoirs.

Esch-sur-Alzette (Luxembourg), Van Neste, Albert, Ingénieur. 1 vol., 417 pages, 763 figures et 16 planches. (Prix: 325 francs belges.)

1933 531

PAINLEVE (P.) et PLATRIER (Ch.).

Cours de mécanique.

Paris (VI^e), Gauthier-Villars, 55, quai des Grands-Augustins. 1 volume (23×28), 644 pages. (Prix: 150 francs français.)

1933 385. (02

PLACE (P.).

Agenda de chemin de fer.

Paris, Dunod, 92, rue Bonaparte. 1 volume (10×15), 426 pages et 63 figures.

1933 665 .882

Recueil de la soudure autogène.

Tome I. — **Construction des conduites.**
— II. — **Construction des appareils et récipients.**
— III. — **Constructions métalliques.**
— IV. — **Soudure des métaux non ferreux.**

Paris, Ch. Béranger, 15, rue des Saints-Pères, et Liége, 1, quai de la Grande-Bretagne.

Tome I: 1 vol. (22×31), 90 pages et 160 figures;
— II: — 94 — 134 —
— III: — 138 — 250 —
— IV: — 96 — 173 —

(Prix: Respectivement 30, 30, 40 et 30 fr. français).

1933 62. (01 & 621

SCHLAG (A.) et DEMARS (C.).

Problèmes de résistance des matériaux appliquée au calcul des éléments de machines.

Liége, Georges Thone. 1 vol. (Prix: 30 francs belges.)

1933 625 .111

Tracé des voies de chemin de fer.

Lyon, Marc Camus, 3, avenue de la Bibliothèque, 1 volume. (Prix: 18 francs français.)

In German.

1933 656 .23

ADOLPH (E.).

Eisenbahn-Gütertarifwesen.

Berlin, Verkehrswissenschaftliche Lehrmittelgesellschaft m. b. H. bei der Deutschen Reichsbahn. 1 Band, 106 Seiten. (Preis: 7.15 R. M.)

1933 721 .9

BEYER (K.).

Die Statik im Eisenbetonbau.

Leipzig, Johann Ambrosius Barth & Brüssel, Falk, Fils, 22, rue des Paroissiens. 1 Band, 389 Seiten, Tabellen und 572 Abbildungen. (Preis: 32.50 R. M.)

1933 721 .9

BLEICH (F.).

Stahlhochbauten.

Leipzig, Johann Ambrosius Barth & Brüssel, Falk, Fils, 22, rue des Paroissiens. 2 Bände, 559 und 934 Seiten und 509 Abbildungen. (Preis: 46.50 R.M.)

1933 691 & 721 .9

EMPERGER (F.).

Handbuch für Eisenbetonbau.

Berlin, Wilhelm Ernst & Sohn. 1 Band, 241 Seiten & Abbildungen. (Preis: 5.50 R.M.)

1933 691

GIRNDT (M[illegible].

Baustoffkunde.

Leipzig, Johann Ambrosius Barth & Brüssel, Falk, Fils, 22, rue des Paroissiens. 1 Band, 196 Seiten mit 148 Abbildungen. (Preis: 6 R.M.)

1933 385 (.43)
MMER (G.).
Die Deutsche Reichsbahn als Auftraggeberin der itschen Wirtschaft.
Berlin, Verkehrswissenschaftliche Lehrmittelgesellhaft m. b. H. bei der Deutschen Reichsbahn. 1 Band, 1 Seiten mit 31 Abbildungen. (Preis: 4.50 R.M.)

1933 656 .2 (02
EINRICH (A.).
Eisenbahnbetriebslehre.
Leipzig, Johann Ambrosius Barth & Brüssel, Falk, ls, 22, rue des Paroissiens. 1 Band, 848 Seiten und Tafeln. (Preis: 11.50 R.M.)

1933 624
LEINLOGEL (A.).
Mehrstielige Rahmen.
Berlin, Wilhelm Ernst & Sohn. 1 Band, 287 Seiten id 650 Abbildungen. (Preis: 24.50 R.M.)

1933 536
NOBLAUCH (O.), RAISCH (E.), HAUSEN (H.) & OCH (W.).
Tabellen und Diagramme für Wasserdampf, berechnet is der spezifischen Wärme.
München und Berlin, R. Oldenbourg. 1 Band, 40 Sein. 2 Diagrammtafeln und 1 Abbildung.

1933 625 .26 (.43)
ÜHNE (P.).
Die Bedeutung einer planmässigen Erhaltungswirthaft beim Fahrzeugpark für die Deutsche Reichshn.
Berlin, Verkehrswissenschaftliche Lehrmittelgesellhaft m. b. H. bei der Deutschen Reichsbahn. 1 Band, Seiten mit 11 Abbildungen. (Preis: 2 R.M.)

1933 385. (08
ETHER (A.).
Alphabetisches Ortsverzeichnis
Berlin, Barthol & Co. 1 Band, 671 Seiten. (Preis: R.M.)

1933 625 .113
ARRAZIN (O.) & OBERBECK (H.).
Taschenbuch zum Abstecken von Kreisbogen mit nd ohne Übergangsbogen für Eisenbahnen, Strassen nd Kanäle.
Leipzig, Johann Ambrosius Barth & Brüssel, Falk, ils, 22, rue des Paroissiens. 1 Band, 300 Seiten und Textabbildungen. (Preis: 6 R.M.)

1933 656 .225
Schnellste Beförderung von Frachtgutladungen auf er Deutschen Reichsbahn von Ausland zu Ausland.
Berlin. Bestellungen bei den Reichsbahndirektionen, en Verkehrsagenturen der Deutschen Reichsbahn Gellschaft im Auslande und dem Werbebüro. 9 Karten it Zahlentaf.

1933 585 (.43)
SCHWARZE.
Reichsbahn und Wissenschaft.
Berlin, Verkehrswissenschaftliche Lehrmittelgesellschaft bei der Deutschen Reichsbahn. 1 Band, 103 Seiten und 4 Abbildungen. (Preis: 3.60 R.M.)

1933 62 (02
UHLAND (W. H.).
Uhlands Ingenieur-Kalender 1934.
Leipzig, Kröner, Alfred. 2 Bände, 288 Seiten mit Zahlentaf. und Abbildungen und 1 069 Seiten mit Zahlentaf. und Abbildungen. (Preis: 5.40 R.M.)

In English.

1933 625 .142.2 (06 (.73) & 691 (06 (.73)
AMERICAN WOOD-PRESERVERS' ASSOCIATION.
Proceedings of the twenty-ninth annual meeting held at Hotel Sherman, Chicago, Ill., January 24-26, 1933.
Washington, D. C. Published by the Association. 522 pages, tables & fig.

1933 351 .712 (06
British Standards Institution annual report and indexed list of British standard specifications. (C. D. 800), July, 1933.
London, S. W. 1. Published by the Institution. (8 1/2 × 5 1/2 inches), 96 pages. (Price: 1 sh.)

1933 656 .232
DANIELS (W. M.).
The price of transportation service.
New York. Published by Harper & Brothers. (7 1/2 × 5 inches), 86 pages. (Price: 75 cents.)

1933 621 .39
EDGCUMBE (K.) & OCKENDEN (F. E. J.).
Industrial electrical measuring instruments.
London and New York. Isaac Pitman & Sons. (6 × 9 inches), 553 pages, illust., diagr. and tables. (Price: $ 7.50.)

1933 385. (08 (.52)
GOVERNMENT OF JAPAN. DEPARTMENT OF RAILWAYS.
Annual report for the year ending March 31st, 1932.
Tokyo, Printed at the Tokyo Tsukiji Type Foundry, Ltd. 300 pages, tables & fig.

1933 347 .763 (.73)
MULLER (HELEN M.).
Federal regulation of motor transport.
New York. Published by the H. W. Wilson Company. (7 3/4 × 5 inches), 154 pages. Bound in Cloth. (Price: 90 cents.)

1933 656 .255
ROBERTS (W. S.).
Railway track occupation: Description of safeguards and economies. Bulletin No. 15 of the Railway Signal Co. Ltd., Fazakerley, Liverpool 9.

1933 **621 .392**
STOCKTON (R. C.), A. I. M. M.
Principles of electric welding: metallic arc process.
London, W. C. 2. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway. (Price: 10 sh. 6 d. net.)

1933 **385 .15 (.81)**
SMITH DUNCAN (JULIAN).
Public and private operation of railways in Brazil.
New York. Published by the Columbia University Press. (8 3/4 × 6 inches), 243 pages. (Price: $ 3.75.)

1933 **656 .2 (02**
WILLIAMSON (J. W.), B. Sc. Barrister-at-Law.
A British Railway behind the scenes.
A study in the science of industry.
London, Ernest Benn Limited. One volume (9 × 5 1/2 inches), of 214 pages, illustrated. (Price, cloth-bound: 5 sh. net.)

1933 **529 (06**
WORLD CALENDAR ASSOCIATION.
Journal of calender reform.
New York City. Published by the World Calender Association, Inc., 485, Madison Avenue. 168 pages.

1933 **621 .1**
The running and maintenance of steam reciprocating machinery.
London, E. C. 3. The Institute of Marine Engineers, 85/88, The Minories. (Price: 5 sh. net.)

In Spanish.

1933 **621 .4**
PUERTAS (E. S.).
Automotores para ferrocarriles con motor de com bustión interna.
Madrid, Asociación general de transportes por vi férrea. 1 volumen, 87 páginas y figuras.

In Italian.

1933 **721 .**
MASI (F.).
La pratica delle costruzioni metalliche.
Milano, U. Hoepli. 1 volume (18 × 25 cm.), 530 pa gine & 433 figure e tavole e 15 grandi tavole costrut tive. (Prezzo: 80 Lire.)

In Dutch.

1933 **656. (0**
Handboek voor Spoorwegtechniek.
Deel I: Aardebaan, kunstwerken, gebouwen van de weg, opmetingen, enz.
Leiden, A. W. Sijthoff's, Uitgevers-Maatschappij N. V

[016 .385 (05]

II. — PERIODICALS.

In French.

Annales des Ponts et Chaussées (Paris).

1933 **624 .2**
Annales des ponts et chaussées, partie technique, juillet-août, p. 121.
BACHET. — Note sur le **flambage** d'une pièce comprimée stabilisée par des réactions latérales. (2 900 mots & fig.)

Annales des travaux publics de Belgique. (Bruxelles.)

1933 **625 .113**
Ann. des travaux publics de Belgique, août, p. 535; octobre, p. 675.
LAMOEN (J.). — Le tracé des **raccordements** progressifs. (8 700 mots & fig.)

1933 **691**
Ann. des travaux publics de Belgique, août, p. 551.
DUTRON (R.). — Etude sur les **sables.** (5 800 mots, 6 tableaux & fig.)

Arts et Métiers. (Paris.)

1933 **621 .**
Arts et Métiers, septembre, p. 25.
DOMBROVSKI (P.). — Suralimentation et com poundage des **moteurs à combustion.** (12 200 mots & fig.)

1933 **656 .1 & 656 .**
Arts et Métiers, octobre, p. 241.
DEGLARGE. — Comment allier **le rail et la route** (7 500 mots & fig.)

Bulletin de la Société des ingénieurs civils de France. (Paris.)

1933 **621 .39**
Bull. de la Soc. des ing. civ. de France, mai-juin, p. 523
LOUIS (J.). — La **soudure électrique** et la construc tion des **réservoirs soudés.** (12 000 mots, 5 tableau & fig.)

1933 **385. (09 (.7 + .8**
Bull. de la Soc. des ing. civ. de France, mai-juin, p. 616
SANTIAGO MARIN y ICUNA. — Le **chemin de fe intercontinental panaméricain** (3 600 mots, fig. & carte

1933 656 .1 & 656 .2
ull. de la Soc. des ing. civ. de France, mai-juin, p. 629.
DUPUIS (M. D.). — **Le rail et la route.** (50 000 ots.)

1933 621 .43
ull. de la Soc. des ing. civ. de France. Procès verbal de la séance du 27 octobre, p. 383.
DUMAS (L.). — Conditions d'emploi des **automotrices Diesel** sur les grands réseaux de chemins de fer. ommunication et discussion. (11 800 mots.)

1933 656 .1 & 656 .2
ull. de la Soc. des ing. civ. de France. Procès-verbal de la séance du 10 novembre, p. 429.
PIESSÈS (R.). — Quelques aspects de la **lutte entre e chemin de fer et l'automobile.** (6 300 mots.)

Bulletin de l'Union internationale des chemins de fer. (Paris.)

1933 656 .1 (.4) & 656 .2 (.4)
ull. de l'Union intern. des ch. de fer, août-septembre, p. 302.
Rapport des Chemins de fer allemands et des Chemins le fer fédéraux suisses sur la question: **Concurrence t coopération en trafics voyageurs et marchandises ntre chemin de fer et automobile.** (Juin, 1933). (21 000 ots.)

1933 313 .385
ull. de l'Union intern. des ch. de fer, août-septembre, p. 326.
Statistique internationale des chemins de fer (3 700 ots.)

1933 385 .4 (.44)
ull. de l'Union intern. des ch. de fer, octobre, p. 341.
Modifications au **régime des grands réseaux de che**ins de fer français. (9 300 mots.)

1933 385 .1 (.494)
ull. de l'Union intern. des ch. de fer, octobre, p. 351.
La situation financière des Chemins de fer fédéraux uisses et les résultats de leur exploitation en 1932, (9 700 mots.)

1933 385 .113 (.44)
ull. de l'Union intern. des ch. de fer, octobre, p. 362.
Les résultats de l'exploitation des cinq grandes compagnies de chemins de fer français en 1932. (12 200 ots.)

1933 385. (06.12
ull. de l'Union intern. des ch. de fer, octobre, p. 376.
L'union des administrations de chemins de fer de l'Europe Centrale. (4 400 mots.)

Bulletin des transports internationaux par chemins de fer. (Berne.)

1933 656 .235.7
ull. des transp. intern. par ch. de fer, octobre, p. 414.
GIANNINI (A.). — La réglementation uniforme du **transport des colis express.** (4 100 mots.)

1933 313 .385 (.45)
ull. des transp. intern. par ch. de fer, octobre, p. 455.
Résultats de l'exploitation des chemins de fer italiens de l'Etat pour l'exercice 1931-32. (1 600 mots.)

Bulletin technique de la Suisse romande. (Vevey.)

1933 624 .2
ull. techn. de la Suisse romande, n° 20, 30 septembre, p. 241.
TRÜB. — **Calcul statique de cadres rectangulaires rigides à angles arrondis sous pression uniforme.** (700 mots & fig.)

1933 656 .22 (.493)
ull. techn. de la Suisse romande, n° 20, 30 septembre, p. 243.
KATEL (I.). — Les **« Trains-radio »** de la Société Nationale des Chemins de fer belges. (1 000 mots & fig.)

1933 621 .43
ull. techn. de la Suisse romande, n° 23, 11 novembre, p. 287.
Le **moteur Diesel** dans la traction sur rails. (2 200 mots & fig.)

Chronique des transports. (Paris.)

1933 656 .225 (.44)
Chronique des transports, n° 19, 10 octobre, p. 3.
Les chemins de fer français et le **transport des produits coloniaux.** (3 600 mots.)

1933 656 .1 (.64)
Chronique des transports, n° 21, 10 novembre, p. 3.
La réglementation des **transports automobiles** au Maroc. (1 700 mots.)

Génie civil. (Paris.)

1933 62. (01
Génie civil, n° 2668, 30 septembre, p. 323; n° 2669, 7 octobre, p. 347.
LAZARD (R.). — Le calcul des **ouvrages circulaires.** (6 400 mots & fig.)

1933 624 .63 (.485)
Génie civil, n° 2668, 30 septembre, p. 332.
Le nouveau **pont en béton armé** sur le Tranebergssund, à Stockholm. (1 600 mots & fig.)

1933 621 .132.8 (.44) & 621 .43 (.44)
Génie civil, n° 2669, 7 octobre, p. 341.
MARTIN (H.). — Les nouvelles **automotrices à moteurs** des Chemins de fer de l'Etat. (6 700 mots & fig.)

1933 624 .63 (.44)
Génie civil, n° 2670, 14 octobre, p. 365.
ROUSSEL (L.). — La **reconstruction du pont** de Champigny, sur la Marne. Serrage du béton armé par des appareils de pervibration. (3 800 mots & fig.)

1933 **669 .1**
Génie civil, n° 2670, 14 octobre, p. 369.
SEIGLE (J.). — Nouvelle théorie proposée pour la formation des **aciers recuits.** (4 700 mots & fig.)

1933 **621 .43**
Génie civil, n° 2670, 14 octobre, p. 380.
Nouvelle **automotrice Diesel,** à deux bogies moteurs, des Etablissements de Dietrich & Cie. (1 600 mots & fig.)

1933 **669 .1**
Génie civil, n° 2671, 21 octobre, p. 400.
SEIGLE (J.). — Nouvelle théorie proposée pour la formation des **aciers recuits.** (3 800 mots & fig.)

1933 **62. (01 & 721 .9**
Génie civil, n° 2671, 21 octobre, p. 403.
JUILLARD (H.). — La recherche et la mesure des déformations dans les grands **barrages en béton.** (4 200 mots & fig.)

1933 **62. (01 & 691**
Génie civil, n° 2672, 28 octobre, p. 430.
MARCOTTE (E.). — L'essai rapide des **chaux et ciments** sur les chantiers. (2 700 mots & fig.)

1933 **691**
Génie civil, n 2673, 4 novembre, p. 445.
LOSSIER (H.). — Où les progrès de la technique actuelle conduisent-ils le **béton armé ?** (2 700 mots et fig.)

1933 **669**
Génie civil, n° 2674, 11 novembre, p. 479.
Nouveaux trains de laminoir obliques pour la fabrication des **tubes sans soudure,** en partant de corps creux. (1 500 mots & fig.)

La Science et la Vie. (Paris.)

1933 **531 .45 & 621 .89**
La Science et la Vie, octobre, p. 303.
CHARMEIL (A.). — Comment, en mécanique, les « roulements » ont vaincu les frottements. **Roulements à billes, à rouleaux, à aiguilles, sur huile.** (4 400 mots & fig.)

La Traction électrique. (Paris.)

1933 **621 .33 (06**
La Traction électrique, septembre, p. 161.
La **traction électrique** au Congrès international d'électricité de Paris (juillet 1932). (4 900 mots.)

Les Chemins de fer et les Tramways. (Paris.)

1933 **621 .131.3 (.44)**
Les Chemins de fer et les Tramways, septembre, p. 205.
Le **banc d'essais** de locomotives de Vitry de l'Office Central d'Etudes de matériel de chemins de fer. (4 000 mots & fig.)

1933 **621 .4**
Les Chemins de fer et les Tramways, septembre, p. 21
SPIESS (E.). — **Automotrice économique Diesel** pou voie métrique. (6 500 mots & fig.)

1933 **625 .21**
Les Chemins de fer et les Tramways, septembre, p. 21
La **roue élastique** « Pneuacier ». (1 600 mots fig.)

1933 **621 .133.**
Les Chemins de fer et les Tramways, septembre, p. 21
Surchauffeur avec tubes de retour. (1 300 mots & fig.

1933 **625 .15**
Les Chemins de fer et les Tramways, septembre, p. 22
DESGARDES (E.). — Note concernant l'étude et l calcul des **croisements** pour voies portatives. (3 60 mots & fig.)

1933 **625 .142.**
Les Chemins de fer et les Tramways, septembre, p. 22
Traverse métallique pour voies ferrées. (800 mot & fig.)

1933 **625 .142.**
Les Chemins de fer et les Tramways, septembre, p. 22
Les **traverses en pin.** Injection et utilisation. (1 60 mots.)

1933 **621 .33 (.47**
Les Chemins de fer et les Tramways, octobre, p. 23
L'**électrification** des lignes de la banlieue de Mosco et la ligne de jonction métropolitaine projetée. (3 10 mots & fig.)

1933 **621 .132.3 (.42**
Les Chemins de fer et les Tramways, octobre, p. 23
Locomotive Pacific à simple expansion, n° 6200 d London Midland & Scottish Railway. (8 000 mots & fig

1933 **621 .4**
Les Chemins de fer et les Tramways, octobre, p. 24
Boîte de vitesses type « Supersouple » pour locotrac teurs Diesel. (2 800 mots & fig.)

1933 **625 .21**
Les Chemins de fer et les Tramways, octobre, p. 24
Bogie amorti pour automotrice électrique légèr (3 600 mots & fig.)

1933 **625 .23**
Les Chemins de fer et les Tramways, octobre, p. 24
DESGARDES (E.). — Etude **d'installation de cou chettes** dans les voitures de chemins de fer. (2 800 mot mots & fig.)

1933 **625 .253 & 625 .25**
Les Chemins de fer et les Tramways, octobre, p. 25
Freinage combiné électro-magnétique et à air com primé. (1 800 mots & fig.)

1933 **65**
Les Chemins de fer et les Tramways, novembre, p. 23
Le remplacement des trains par les **services automo biles** et le retour au rail. (3 900 mots.)

1933 **621 .132.3 (.44)**
Les Chemins de fer et les Tramways, novembre, p. 260.
SPIESS (E.). — La **locomotive Pacific transformée** 231-F-141 du P. L. M. (4 500 mots & fig.)

1933 **621 .33**
Les Chemins de fer et les Tramways, novembre, p. 268.
VALAT (A.). — Les méthodes d'étude du mouvement des **trains électriques** et leur application à la prédétermination du matériel de traction électrique et à sa bonne utilisation en service. (6 400 mots & fig.) (A suivre).

1933 **625 .215**
Les Chemins de fer et les Tramways, novembre, p. 272.
DESGARDES (E.). — Etude d'un **bogie** en acier moulé pour matériel à voie de 1 mètre. (5 200 mots & fig.)

1933 **625 .143.1 (.44)**
Les Chemins de fer et les Tramways, novembre, p. 277.
Le **nouveau rail** de la Compagnie P. L. M. (1 800 mots & fig.)

L'Industrie des voies ferrées et des transports automobiles. (Paris.)

1933 **656 .1 (.494) & 656 .2 (.494)**
L'Ind. des voies ferrées et des transp. autom., août, p. 260.
Les arguments en faveur de l'**accord du rail et de la route** en Suisse. (3 300 mots.)

1933 **656 .1 & 656 .2**
L'Ind. des voies ferrées et des transp. autom., août, p. 263.
Rapport des **Chemins de fer fédéraux sur la réglementation officielle de la concurrence** à l'étranger. (5 500 mots.)

1933 **621 .33 (.42)**
L'Ind. des voies ferrées et des transp. **autom., août**, p. 268.
L'**électrification** de la ligne Londres (Victoria) à Brighton de la Compagnie du Southern Railway. (1 200 mots & fig.)

1933 **625 .62**
L'Ind. des voies ferrées et des transp. autom., septembre, p. 42.
DE LARMINAT. — **Mesures d'exploitation commerciale** susceptibles d'augmenter la vitesse des tramways et des autobus. (8 400 mots & fig.)

1933 **625 .62**
L'Ind. des voies ferrées et des transp. autom., septembre, p. 60.
GOUJON. — **Visite et nettoyage de nuit des voitures de tramways. Installations et moyens mécaniques propres à augmenter le rendement du personnel.** (3 800 mots & 6 tableaux.)

Revue de l'Ecole polytechnique. (Bruxelles.)

1933 **656 .254**
Revue de l'Ecole polytechnique, octobre, p. 3.
BETTE (J.). — **L'arrêt automatique des trains.** (3 300 mots & fig.)

Revue générale des chemins de fer. (Paris.)

1933 **621 .131.3 (.44)**
Revue générale des chemins de fer, octobre, p. 331.
PLACE (P.). — **Banc d'essais de locomotives** des réseaux français, à Vitry-sur-Seine. (6 400 mots & fig.)

1933 **625 .173 (.44)**
Revue générale des chemins de fer, octobre, p. 348.
EHRMANN. — **Les renouvellements de ballast** au moyen d'engins mécaniques sur le réseau d'Alsace et de Lorraine. ((3 400 mots & fig.)

1933 **625 .143.3**
Revue générale des chemins de fer, octobre, p. 357.
Le rechargement des rails au chalumeau oxy-acétylénique. (2 200 mots & fig.)

1933 **313 .385 (.44)**
Revue générale des chemins de fer, octobre, p. 362.
Résultats obtenus en 1932 sur les réseaux des cinq compagnies principales des chemins de fer français. (1 400 mots.)

1933 **385 .113 (.494)**
Revue générale des chemins de fer, octobre, p. 372.
Les **résultats d'exploitation** des Chemins de fer fédéraux en 1932. (4 700 mots.)

1933 **621 .335 (.44)**
Revue générale des chemins de fer, novembre, p. 407.
LEBOUCHER. — La **locomotive électrique** à grande vitesse type 2-D-2, série E. 4801 de la Compagnie des Chemins de fer du Midi. (8 400 mots & fig.)

1933 **625 .123**
Revue générale des chemins de fer, novembre, p. 429.
GIRAL. — **Assainissement** de voies principales en exploitation dans les tranchées argileuses. (2 900 mots & fig.).

1933 **385 .113 (.44)**
Revue générale des chemins de fer, novembre, p. 437.
Résultats d'exploitation des Chemins de fer d'Alsace et de Lorraine en 1932. (4 400 mots.)

1933 **385 .113 (.493)**
Revue générale des chemins de fer, novembre, p. 450.
Résultats du sixième exercice (1932) de la Société Nationale des Chemins de fer belges. (4 300 mots.)

1933 **621 .135.1 (.44)**
Revue générale des chemins de fer, novembre, p. 457.
Appareil pare-brise pour locomotives. (500 mots & fig.)

Revue universelle des Mines. (Liége.)

1933 **621 .133.1**

Revue universelle des mines, n° 20, 15 octobre, p. 537.

MOTCHAROFF (N. M.) & SOKOLOFF (A. S.). — Mécanisation du **contrôle de la dépense en combustible et du parcours des locomotives.** Compteurs pour locomotives « Rona ». (3 300 mots & fig.) (A suivre.)

1933 **621 .133.1**

Revue universelle des mines, n° 21, 1er novembre, p. 574.

MOTCHAROFF (N. M.) & SOKOLOFF (A. S.). — Mécanisation du **contrôle de la dépense en combustible et du parcours des locomotives.** Compteurs pour locomotives « Rona ». (3 800 mots & fig.)

Revue universelle des transports et des communications. (Paris.)

1933 **385 .11**

Revue universelle des transports et des communications, octobre, p. B. 10.

SZTOLCMAN (S.). — Calcul des **dépenses d'exploitation** des chemins de fer projetés. (2 500 mots & 2 tableaux.) (A suivre).

1933 **625 .216 (.4)**

Revue universelle des transports et des communications, octobre, p. B. 19.

ZEHNDER (R.). — L'état actuel de la question de **l'attelage automatique** des véhicules de chemins de fer en Europe. (5 000 mots.)

In German.

Archiv für Eisenbahnwesen. (Berlin.)

1933 **385**

Archiv für Eisenbahnwesen, Juli-August, S. 845.

HAUSTEIN (W.). — Die Lehre von den Öffentlichen Sachen und vom Öffentlichen Eigentum im **Eisenbahnrecht.** (16 500 Wörter.)

1933 **656 .214**

Archiv für Eisenbahnwesen, Juli-August, S. 889. September-Oktober, S. 1115.

MEYER. — Über einige Verwaltungs-, Finanz- und Rechtsfragen der **Betriebswechsel-Bahnhöfe.** (21 100 Wörter.)

1933 **385 .113 (.438)**

Archiv. für Eisenbahnwesen, Juli-August, S. 995.

WYSZOMIRSKI (K. Dr.). — Die **Polnischen Staatsbahnen** im Jahr 1930. (7 200 Wörter.)

1933 **313 .385 (.494)**

Archiv für Eisenbahnwesen, Juli-August, S. 1017.

NITSCHKE. — Die **Schweizerischen Bundesbahnen** im Jahr 1931. (1 500 Wörter.)

1933 **385 .113 (.439)**

Archiv für Eisenbahnwesen, Juli-August, S. 1024.

BÉLA ROMAK. — Die **Königlich Ungarischen Staatsbahnen** im Betriebsjahr 1930-31. (4 200 Wörter.)

1933 **385 .113 (.44)**

Archiv für Eisenbahnwesen, Juli-August, S. 1046.

NITSCHE. — Die **Betriebsergebnisse** der fünf grossen französischen Eisenbahn-gesellschaften in den Jahren 1930 und 1931. (1 900 Wörter.)

1933 **385 .1 (.494)**

Archiv für Eisenbahnwesen, September-Oktober, S. 1149.

Die **Finanzlage** der Schweizerischen Bundesbahnen und Vorschläge für ihre Sanierung. (4 900 Wörter.)

1933 **385 .517 (.43)**

Archiv für Eisenbahnwesen, September-Oktober, S. 1213; November-Dezember, S. 1411.

KUHATSCHECK (O.). — Die **Kranken- und Arbeiterpensionskassen, die Angestellten-, Unfall- und Arbeitslosenversicherung** bei der Deutschen Reichsbahn im Jahr 1932. (18 200 Wörter.)

1933 **385 .113 (.493)**

Archiv für Eisenbahnwesen, September-Oktober, S. 1251.

von RENESSE. — Die nationale Gesellschaft der belgischen Eisenbahnen im fünften **Geschäftsjahr** (1. Januar bis 31. Dezember 1931), dargestellt auf Grund des Geschäftsberichts der Gesellschaft und des Berichts des Verwaltungsrats. (5 300 Wörter.)

1933 **385. (09.1 (.62)**

Archiv für Eisenbahnwesen, Oktober, S. 1271.

DIECKMANN. — Die **Ägyptischen Staatsbahnen.** (3 200 Wörter.)

1933 **385. (09.1 (.59)**

Archiv für Eisenbahnwesen, September-Oktober, S. 1283.

PASCHEN (W.). — Die **Eisenbahnen und Verkehrstrassen Indochinas.** (2 700 Wörter & Karte.)

1933 **385 .111 (.68)**

Archiv für Eisenbahnwesen, September-Oktober, S. 1293.

DIECKMANN. — Die **Beira-, Mashonaland- und Rhodesischen Eisenbahnen** im Jahr 1930-31. (3 000 Wörter & Karte.)

1933 **385. (09 (.43)**

Archiv für Eisenbahnwesen, November - Dezember, S. 1343.

ESSELBRÜGGE. — Die **Abhängigkeit des norddeutschen Eisenbahnnetzes von der Geländegestaltung.** (17 700 Wörter & Karte.)

1933 **313 .385 (.43)**

Archiv für Eisenbahnwesen, November - Dezember, S. 1451.

Die **Eisenbahnen des Deutschen Reichs 1931.** (7 600 Wörter.)

1933 **385 .113 (.437)**

Archiv für Eisenbahnwesen, November - Dezember, S. 1495.

Die **Eisenbahnen** der tschechoslowakischen Republik im Jahr 1931. (6 800 Wörter.)

1933 **313 .385 (.73)**

Archiv für Eisenbahnwesen, November - Dezember, S. 1517.

Die **Eisenbahnen** der Vereinigten Staaten von Amerika in den Jahren 1930 und 1931. (5 300 Wörter & Karte.)

Die Lokomotive. (Wien).

1933 **621 .132.1 (.47)**

Die Lokomotive, Oktober, S. 181.

Vom **russischen Lokomotivbau.** I. (2 800 Wörter & Abb.)

1933 **621 .132.1 (.45)**

Die Lokomotive, Oktober, S. 185.

STEFFAN. — Neuerungen im **Lokomotivbestand** der kgl. italienischen Staatsbahnen. (5 000 Wörter & Abb.)

1933 **621 .132.1 (.56)**

Die Lokomotive, November, S. 201.

Neue **Lokomotivbauarten** der Türkischen Staatsbahnen. (1 800 Wörter & Abb.)

Elektrische Bahnen. (Berlin.)

1933 **621 .335**

Elektrische Bahnen, September, S. 208.

MIROW (L.). — **Nutzbremsung** bei Einphasen-Wechselstrom-Triebwagen. (1 900 Wörter & Abb.)

1933 **621 .335**

Elektrische Bahnen, September, S. 218.

APELT (O.). — Eine neue Einrichtung zur besseren Ausnutzung des Reibungsgewichtes für **elektrische Drehgestellokomotiven** mit Einzelachsantrieb. (1 700 Wörter & Abb.)

1933 **621 .33 (.73)**

Elektrische Bahnen, Oktober, S. 225.

SCHMITT (H.). — Der **elektrische Betrieb** der Eisenbahnen von New York. (2 000 Wörter, Karte & Abb.)

1933 **621 .392 & 621 .335**

Elektrische Bahnen, Oktober, S. 229.

REITER (M.). — Die **Lichtbogenschweissung** im Bau elektrischer Lokomotiven. (2 900 Wörter & Abb.)

1933 **621 .333**

Elektrische Bahnen, Oktober, S. 235.

FLASSER (A.). — Neue Schaltungen **zur Prüfung** von **Reihenschluss-Bahnmotoren** unter Last. (5 100 Wörter & Abb.)

Glasers Annalen. (Berlin.)

1933 **385 (.42)**

Glasers Annalen, Heft 5, 1. September, S. 33.

WERNEKKE. — Die **englischen Eisenbahnen** im Jahre 1932. (3 400 Wörter & Abb.)

1933 **621 .114**

Glasers Annalen, Heft 5, 1. September, S. 36.

STEINITZ (O.). — Vergleichsweise **Wertung von Kolbenmaterialien** (2 600 Wörter.)

1933 **621 .133.1 (.43)**

Glasers Annalen, Heft 6, 15 September, S. 41; Heft 7, 1. Oktober; S. 149; Heft 8, 15 Oktober, S. 57.

SUSSMANN. — Einige Fortschritte der **Brennstoff- und Wärmewirtschaft** in ihrer Anwendung bei der Reichsbahn. (12 800 Wörter & Abb.)

Organ für die Fortschritte des Eisenbahnwesens. (Berlin.)

1933 **621 .135.4 & 625 .215**

Organ für die Fortschritte des Eisenbahnwesens, Heft 19, 1. Oktober, S. 363.

HEUMANN. — Die **freien Lenkachsen** im Gleisbogen bei Einpunktberührung. (8 900 Wörter & Abb.)

1933 **656 .221**

Organ für die Fortschritte des Eisenbahnwesens, Heft 19, 1. Oktober, S. 375.

BLOCH (A.). — **Längswellen in Eisenbahnzügen.** (3 300 Wörter & Abb.)

1933 **625 .251**

Organ für die Fortschritte des Eisenbahnwesens, Heft 19, 1. Oktober, S. 379.

TERDINA (L.). — Ein zeichnerisches Verfahren zur **Ermittlung der Zug- und Druckkräfte** in einem gebremsten Eisenbahnzug. (2 800 Wörter & Abb.)

1933 **62. (08**

Organ für die Fortschritte des Eisenbahnwesens, Heft 20, 15 Oktober, S. 385.

KOCH (H. W.) & ZELLER (W.). — Anwendung von **Schwingungsmessern** im Eisenbahnwesen. (4 200 Wörter & Abb.)

1933 **625 .14 (01**

Organ für die Fortschritte des Eisenbahnwesens, Heft 20, 15 Oktober, S. 390.

SALLER. — Zur Frage der einheitlichen **Berechnung des Eisenbahnoberbaues.** (2 100 Wörter & Abb.)

1933 **625 .14 (01**

Organ für die Fortschritte des Eisenbahnwesens, Heft 20, 15 Oktober, S. 393.

PFUNGEN (R.). — **Grenzleistung von Eisenbahnstrecken.** (2 200 Wörter & Abb.)

1933 **656 .254 (.43)**

Organ für die Fortschritte des Eisenbahnwesens, Heft 20, 15 Oktober, S. 401.

Selbsttätige Warnlichtanlagen an schienengleichen Wegübergängen. (700 Wörter.)

1933 **625 .26**

Organ für die Fortschritte des Eisenbahnwesens, Heft 21, 1. November, S. 403.

SCHWERING. — Die Bildung von Richtwerten für die **Kosten der Personenwagenunterhaltung.** (9 400 Wörter & Abb.)

1933 **621 .43 (.43)**

Organ für die Fortschritte des Eisenbahnwesens, Heft 21, 1. November, S. 413.

NIEDERSTRASSER. — Die **Einheitsmotorkleinlokomotive** mit Getriebeübertragung der Deutschen Reichsbahn. (3 300 Wörter & Abb.)

1933 **621 .135.3 & 625 .213**

Organ für die Fortschritte des Eisenbahnwesens, Heft 22, 15. November, S. 421.

BLECK (H.). — Die **Berechnung geschichteter Blattfedern.** (6 000 Wörter, 9 Tafeln & Abb.)

1933 **625 .235**

Organ für die Fortschritte des Eisenbahnwesens, Heft 22, 15. November, S. 437.

KLAUSNER (Fr.). — Neuartige **Sicherheitshandgriffe für Einsteigtüren** van Schienen- und Strassenfahrzeugen. (500 Wörter & Abb.)

Zeitschrift des Vereines Deutscher Ingenieure. (Berlin.)

1933 **62. (01 & 621 .99**

Zeitsch. des Ver. deutsch. Ing., Nr. 39, 30. September, S. 1061.

THUM (A.) & WIEGAND (H.). — Die Dauerhaltbarkeit von **Schraubenverbindungen und Mittel zu ihrer** Steigerung. (2 400 Wörter & Abb.)

1933 **625 .234 (.73)**

Zeitsch. des Ver. deutsch. Ing., Nr. 39, 30. September, S. 1063.

METZELTIN (E. E.). — **Kühlung und Lüftung** amerikanischer **Eisenbahnwagen.** (1 300 Wörter & Abb.)

1933 **621 .9 (.43)**

Zeitsch. des Ver. deutsch. Ing., Nr. 40, 7. Oktober, S. 1081.

WALLICHS (A.). — Die Entwicklung des deutschen **Werkzeugmaschinenbaues** in den letzten vier Jahren. (4 000 Wörter & Abb.)

1933 **621 .91**

Zeitsch. des Ver deutsch. Ing., Nr. 40, 7. Oktober, S. 1113.

BRÖDNER (E.). — Neuere Untersuchungen des **Fräsvorganges.** (2 900 Wörter & Abb.)

1933 **62. (01**

Zeitsch. des Ver. deutsch. Ing., Nr. 42, 21. Oktober, S. 1133.

ESAU (A.) & KORTUM (H.). — Die Veränderlichkeit der **Werkstoffdämpfung.** (1 900 Wörter & Abb.)

1933 **621 .134.3**

Zeitsch. des Ver. deutsch. Ing., Nr. 42, 21. Oktober, S. 1141.

CLAASSEN (H.). — Der Einfluss der Überhitzung des Dampfes auf den **Wärmeübergang.** (1 500 Wörter.)

1933 **621**

Zeitsch. des Ver. deutsch. Ing., Nr. 43, 28. Oktober, S. 1165.

HEIDEBROEK (E.). — Gegenwartsfragen im **Bau von Maschinenteilen.** (6 200 Wörter & Abb.)

1933 **624 .8 (.431)**

Zeitsch. des Ver. deutsch. Ing., Nr. 45, 11. November, S. 1201.

KRESS (W.). — **Die Eisenbahn-Hubbrücke** über die Peene bei Karnin. (2 700 Wörter & Abb.)

1933 **621 .43 (.43)**

Zeitsch. des Ver. deutsch. Ing., Nr. 45, 11. November, S. 1216.

NIEDERSTRASSER (L.). — **Kleinlokomotiven** der Deutschen Reichsbahn. (900 Wörter, 1 Tafel & Abb.)

1933 **621 .116**

Zeitsch. des Ver. deutsch. Ing., Nr. 46, 18. November, S. 1225.

STODOLA (A.). — Der **Sulzer-Einrohr-Dampferzeuger.** Aufbau/Regelung/Regelversuche. (5 400 Wörter & Abb.)

1933 **621 .13**

Zeitsch. des Ver. deutsch. Ing., Nr. 46, 18. November, S. 1237.

METZELTIN (E.). — Die **Entwicklung des Dampflokomotivbaus.** (2 300 Wörter & Abb.)

Zeitschrift für das gesamte Eisenbahn-Sicherungswesen. (Berlin.)

1933 **656 .257**

Zeitsch. für das gesamte Eisenb.-Sicherungsw., Nr. 13, 10. Oktober, S. 145.

FEHLAUER (P.). — Normen und Passungen im **Stellwerkbau.** (3 600 Wörter & Abb.)

1933 **656 .257**

Zeitsch. für das gesamte Eisenb.-Sicherungsw., Nr. 13, 10. Oktober, S. 160.

SVOBODA (A.). — Starre elektromagnetische **Kontrollverriegelung der Weichen** als Ergänzung von elektrischen Weichenantrieben. (2 300 Wörter & Abb.)

Zeitung des Vereins mitteleuropäischer Eisenbahnverwaltungen. (Berlin.)

1933 **656 .2**

Zeitung des Vereins mitteleurop. Eisenbahnverw., Nr. 38, 21. September, S. 773.

HOFFMANN (A.). — 1 1/2 Jahre **Werbedienst** bei der Reichsbahndirektion Hannover. (5 300 Wörter & Abb.)

1933 **651 (.43)**

Zeitung des Vereins mitteleurop. Eisenbahnverw., Nr. 40, 5. Oktober, S. 820.

SUPPER (C.). — Ein neues **Frachtbrief-Abfertigungsgerät.** (1 200 Wörter & Abb.)

1933 **625 .14 (.47)**

Zeitung des Vereins mitteleurop. Eisenbahnverw., Nr. 41, 12 Oktober, S. 837.

Elektrische Kugel-Mulden-Bahn für 300 km./Std. Geschwindigkeit bei den Sowjets. (1 000 Wörter.)

1933 **625 .245 & 656 .225**

Zeitung des Vereins mitteleurop. Eisenbahnverw., Nr. 41, S. 838.

REFFLER. — **Behälterverkehr** als Stütze gegen den Wettbewerb des Kraftwagens. (1 800 Wörter.)

1933 **625 .143.5**

Zeitung des Vereins mitteleurop. Eisenbahnverw., Nr. 42, 19. Oktober, S. 853.

BÄSELER. — Das verwerfungssichere **Rahmengleis.** (3 200 Wörter & Abb.)

1933 **625 .245 & 656 .225**
Zeitung des Vereins mitteleurop. Eisenbahnverw., Nr. 43, 26 Oktober, S. 869.
BRAUNER (F.). — **Bahn- oder Privatbehälter ?** (7 500 Wörter & Abb.)

1933 **625 .245 & 656 .225**
Zeitung des Vereins mitteleurop. Eisenbahnverw., Nr. 44, 2. November, S. 889.
BÄSELER. — Das **Behältersystem** von Bräuer und seine Eingliederung in ein allgemeines Behältersystem. (2 000 Wörter.)

1933 **656 .231 (.485)**
Zeitung des Vereins mitteleurop. Eisenbahnverw., Nr. 44, 2. November, S. 894.
PASZKOWSKI. — Schwedische **Gütertarifreform.** (1 000 Wörter.)

1933 **385 .1 (.73)**
Zeitung des Vereins mitteleurop. Eisenbahnverw., Nr. 45, 9. November, S. 909.
WITTE (B.). — Die **Eisenbahn-Notgesetzgebung** in den Vereinigten Staaten von Amerika. (6 500 Wörter.)

1933 **656 .1 (.439) & 656 .2 (.439)**
Zeitung des Vereins mitteleurop. Eisenbahnverw., Nr. 45, 9. November, S. 919.
BOGSCH. — Regelung des **Wettbewerbes zwischen Eisenbahn und Lastkraftwagen** in Ungarn. (1 200 Wörter.)

1933 **656 .225 (.43) & 625 .245 (.43)**
Zeitung des Vereins mitteleurop. Eisenbahnverw., Nr. 46, 16. November, S. 929.
CULEMEYER. — **Haus-Haus-Verkehr** mit Wagenladungen. (3 700 Wörter & Abb.)

In English.

Bulletin, American Railway Engineering Association. (Chicago, Ill.)

1933 **624 .2**
Bull., Amer. Railway Eng. Association, July, p. 1.
WILSON (W. M.) & JEWETT (G. E.). — **The flexural strength of short beams.** (1 900 words & tables.)

1933 **624 .8**
Bull., Amer. Railway Eng. Association, July, p. 11.
WILSON (W. M.) & KLUGE (R. W.). — **The strength in bearing of webs of track and segmental girders for rolling bascule bridges.** (6 000 words & fig.)

1933 **624 .2**
Bull., Amer. Railway Eng. Association, July, p. 37.
DAVIS (R. P.). — **Spacing of stiffeners on plate-girder webs.** (1 000 words & fig.)

Engineer. (London.)

1933 **669 .1 (06 (.42)**
Engineer, No. 4055, September 29, p. 305.
The Iron and Steel Institute. Meeting on 14 September 1933. — **Heterogeneity of steel ingots. Beryllium in steel.** (4 500 words.)

1933 **669 (06 (.42)**
Engineer, No. 4055, September 29, p. 306.
The Institute of Metals (Meeting held on 18 September 1933). (5 800 words.)

1933 **62 (06 (.42)**
Engineer, No. 4055, September 29, p. 314.
The British Association, No. III. — **Steel embrittlement.** (2 400 words).

1933 **656 .211.5 (.42)**
Engineer, No. 4055, September 29, p. 315.
Chronoscope clock for Paddington station. (1 500 words & fig.)

1933 **621 .9 (.47)**
Engineer, No. 4056, October 6, p. 330.
Railway axle plant for Russia. (1 700 words & fig.)

1933 **62. (01 & 669 .1**
Engineer, No. 4056, October 6, p. 337.
HURST (J. E.). — **Resistance to wear of nitrogen-hardened cast iron.** (2 600 words, 6 tables & fig.)

1933 **656 .212.6 (.68)**
Engineer, No. 4056, October 6, p. 338.
An 80-ton electric **level-luffing jib crane.** (1 600 words & fig.)

1933 **385**
Engineer, No. 4057, October 13, p. 359.
A railway chairman's address. (Institute of Transport). (Mr. William Whitelaw). (2 400 words.)

1933 **385**
Engineer, No. 4057, October 13, p. 367.
WHITELAW (W.). — **Thirty-five years on the railway — and after.** (3 300 words.)

1933 **621 .335 & 625 .62**
Engineer, No. 4058, October 20, p. 390.
Regenerative trolley omnibuses. (500 words & fig.)

1933 **624 .1, 625 .13 & 721 .1**
Engineer, No. 4059, October 27, p. 398; No. 4060, November 3, p. 422.
JAPP (Sir Henry). — New methods of excavating quicksands. (8 000 words & fig.)

1933 **385. (072 (.42)**
Engineer, No. 4059, October 27, p. 404.
The Post Office research station. (3 200 words & fig.)

1933 **621 .132.6 (.42)**
Engineer, No. 4059, October 27, p. 406.
L. M. S. **tank locomotive.** (100 words & fig.)

1933 **624 .1, 625 .13 & 721 .1**
Engineer, No. 4059, October 27, p. 409.
Excavation in unstable ground. (2 000 words.)

1933 **621 .43 (.42)**
Engineer, No. 4059, October 27, p. 411.
130-h.p. **oil-engine-driven railcar** for Great Western Railway. (4 100 words & fig.)

1933 **625 .142.3**
Engineer, No. 4059, October 27, p. 414.
A new **pot sleeper.** (200 words & fig.)

1933 **621 .43 (064 (.42)**
Engineer, No. 460, November 3, p. 428.
Commercial motor transport exhibition (Olympia). No. I. (3 000 words & fig.)

1933 **621 .31**
Engineer, No. 460, November 3, p. 437.
Mobile generating set. (2 000 words & fig.)

1933 **656 .212.6**
Engineer, No. 460, November 3, p. 439.
Combined winch and derrick. (500 words & fig.)

Engineering. (London.)

1933 **691**
Engineering, No. 3532, September 22, p. 341.
The oxylene timber fireproofing process. (1 300 words.)

1933 **65**
Engineering, No. 3532, September 22, p. 341.
STOPANI STUART (J. C.). — **Organising a research bureau.** (3 800 words, tables & fig.)

1933 **669 .1 (06 (.42)**
Engineering, No. 3533, September 29, p. 351.
THE IRON AND STEEL INSTITUTE. (Meeting on 14 September 1933). — **Heterogeneity of steel ingots. Influence of beryllium on steel. — Alloys of iron and manganese.** (4 900 words.)

1933 **62. (01**
Engineering, No. 3533, September 29, p. 356.
The Javelin electrical etching machine. (600 words & fig.)

1933 **669. (06 (.42)**
Engineering, No. 3533, September 29, p. 365.
The Institute of metals — Birmingham Meeting, 18 September 1933. — **Precipitation-hardening of nickel-copper-aluminium alloys.** (6 300 words.)

1933 **621 .31 (.52)**
Engineering, No. 3534, October 6, p. 376.
The Fusenko **power plant,** Korea. (1 600 words & fig.)

1933 **656 .212.6 (.68)**
Engineering, No. 3534, October 6, p. 383.
80-ton **electrically-operated level-luffing crane.** (2 000 words & fig.)

1933 **621 .94 (.42**
Engineering, No. 3534, October 6, p. 393.
Combination turret lathe with covered bed. (1 80 words & fig.)

1933 **656 .211 (.42) & 656 .212 (.42**
Engineering, No. 3535, October 13, p. 403.
Reconstruction work at Paddington Station, Gre Western Railway. (1 400 words & fig.)

1933 **627 (.44) & 656 .213 (.44**
Engineering, No. 3536, October 20, p. 427; No. 353 Novembr 3, p. 481.
CUNNINGHAM (B.). — The new **passenger qua and maritime station** at the Port of Cherbourg. (3 5 words & fig.)

1933 **66**
Engineering, No. 3536, October 20, p. 429.
HURST (J. E.). — **Permanent set in certain ca non-ferrous alloys and austenitic cast irons.** (2 3 words, 10 tables & fig.)

1933 **621 .335 & 625 .6**
Engineering, No. 3536, October 20, p. 437.
Regenerative-control equipment for trolley 'buse (750 words & fig.)

1933 **53 (06 (.42) & 536 (.42**
Engineering, No. 3536, October 20, p. 444.
The National Physical Laboratory. — **Thermometr conductivity, heats of combustion.** — **Heat transmi sion, insulating materials, humidity.** (2 800 words.)

1933 **62. (01 & 669**
Engineering, No. 3537, October 27, p. 453.
GOULD (A. J.). — The influence of solution co centration on the severity of **corrosion fatigue.** (2 6 words & fig.)

1933 **656 .211 (.42) & 656 .212 (.42**
Engineering, No. 3537, October 27, p. 457.
Paddington Station improvements. (4 400 words fig.)

1933 **621 .138 & 656 .212**
Engineering, No. 3537, October 27, p. 463.
168-ton **dial-indicator locomotive weighbridge.** (4 words & fig.)

1933 **385. (072 (.42**
Engineering, No. 3537, October 27, p. 471.
The Post Office and research. (1 400 words.)

1933 **625 .26 (.54**
Engineering, No. 3537, October 27, p. 473.
Wagon repairs. (1 000 words.)

1933 **621 .3**
Engineering, No. 3538, November 3, p. 485.
Automatic arc-welding for mass-production. (5 8 words & fig.)

1933 **621 .43 (06 (.42)**
Engineering, No. 3538, November 3, p. 497.
The Commercial Vehicle Exhibition at Olympia. (3 600 words & fig.)

1933 **656 .212.6**
Engineering, No. 3538, November 3, p. 501.
Combined derrick and winch. (600 words & fig.)

1933 **621 .133.7**
Engineering, No. 3538, November 3, p. 502.
Improved **water pick-up for locomotives.** (350 words & fig.)

1933 **721 .9**
Engineering, No. 3538, November 3, p. 504.
« Isteg » bars for reinforced concrete. (1 000 words & fig.)

Engineering News-Record. (New York.)

1933 **624 (.73)**
Engineering News-Record, No. 12, September 21, p. 344.
HIRSCHTHAL (M.). — **Girderless flat-slab bridges for grade crossings.** (2 700 words & fig.)

1933 **624 .8**
Engineering News-Records, No. 14, October 5, p. 402.
SIX (W. L.). — **Vertical-lift bridges with synchronous motors.** (1 300 words & fig.)

1933 **55 & 721 .1**
Engineering News-Records, No. 14, October 5, p. 404.
MORAN (D. E.). — **Sampling and soil tests for Bay bridge, San Francisco.** (2 600 words & fig.)

1933 **625 .13 (.73)**
Engineering News-Record, No. 15, October 12, p. 439.
DUNFORD (J. A.). — **Seattle remodels its University bridge.** (850 words & fig.)

1933 **621 .392 & 665 .882**
Engineering News-Record, No. 15, October 12, p. 444.
Recent **welding studies** reported in Chicago. (1 300 words.)

1933 **624**
Engineering News-Records, No. 17, October 26, p. 496.
SORKIN (J.). — **Economy through continuity in girder-beam bridges.** (1 100 words & fig.)

Great Western Railway Magazine. (London.)

1933 **656 .211 (.42), 656 .212 (.42) & 725 .31 (.42)**
Great Western Railway Magazine, November, p. 449.
SHACKLE (C. E.). — **The structural alterations at Paddington Station.** (2 000 words & fig.)

1933 **656 .223.2 (.42)**
Great Western Railway Magazine, November, p. 471.
Commuted charges for the empty haulage of private owners' wagons. (1 100 words & fig.)

Journal of the Institution of Engineers, Australia. (Sydney.)

1933 **621 .331 (.944)**
Journal, Institut, of Eng., Australia, August, p. 253.
MYERS (W. H.). — **The reconstruction of Ultimo power station.** (13 000 words & fig.)

Journal, Institute of Transport. (London.)

1933 **385**
Journal, Institute of Transport, November, p. 7.
WHITELAW (W.). — **Thirty-five years on the railway and after.** (5 700 words.)

1933 **385. (071**
Journal, Institute of Transport, November, p. 15.
HALLSWORTH (H. M.). — **Education for transport.** (13 000 words.)

London & North Eastern Railway Magazine. (London.)

1933 **621 .132.3 (.42) & 659 (.42)**
London & North Eastern Ry. Mag., November, p. 594.
Paperweight model and chart of 4-6-4 type 4-cylinder high pressure compound locomotive 10 000 (sold for advertising purposes).

Mechanical Engineering. (New York.)

1933 **614 .7 & 697**
Mechanical Engineering, October, p. 621.
DELLAVALLE (J. M.). — **The control of industrial dust.** (3 700 words & fig.)

1933 **621 .9**
Mechanical Engineering, November, p. 677.
CARDULLO (F. E.). — **The case for planing : the designer of planers compares the advantages of planing and milling.** (4 800 words & fig.)

1933 **621 .9**
Mechanical Engineering, November, p. 682.
HARRISON (R. E. W.). — **The case for milling.** (3 500 words.)

1933 **621 .89**
Mechanical Engineering, November, p. 685.
KINGSBURY (A.). — **Heat effects in lubricating films.** (2 500 words, 1 table & fig.)

1933 **621 .335 (.47) & 621 .43 (.47)**
Mechanical Engineering, November, p. 700.
Diesel-electric locomotives for Russia. (1 300 words & fig.)

1933 **621 .43 (.460)**
Mechanical Engineering, November, p. 702.
Diesel railcars. (800 words.)

Modern Transport. (London.)

1933 **625 .13 (.42)**
Modern Transport, No. 758, September 23, p. 3.
BRODIÉ (J. A.). — **The Mersey tunnel and the Liverpool-East Lancashire road.** Provision for cross-river and inter-urban traffic. (4 500 words & fig.)

1933 **385 .1 (.71)**
Modern Transport, No. 758, September 23, p. 5.
MANION (Dr. R. J.). — **Transport in Canada.** Railway outlook improving. (1 400 words & fig.)

1933 **656 .236.2 (.42)**
Modern Transport, No. 759, September 30, p. 3.
Privately-owned railway wagons. (1 800 words & 1 table.)

1933 **385. (01 (.42)**
Modern Transport, No. 759, September 30, p. 5,
WILLIAMS (Major C. E.). — **Railway methods in the Colonies.** (2 000 words.)

1933 **621 .132.8 (.493)**
Modern Transport, No. 759, September 30, p. 7.
British-built **steam rail car** for Belgium. Trials in the Liége district. (1 200 words & fig.)

1933 **385 .13 (.42)**
Modern Transport, No. 759, September 30, p. 9.
Valuation of railways. — **Scheme nearing completion.** (2 300 words.)

1933 **656 .211 (.42)**
Modern Transport, N. 760, October 7, p. 3.
Reconstruction of Fenchurch Street Station. (1 000 words & fig.)

1933 **621 .43**
Modern Transport, No. 760, October 7, p. 4.
Diesel locomotives in railway service. — Abstract of a paper read at a meeting of the Institution of Mechanical Engineers, Manchester, October 5, 1935. (3 600 words.)

1933 **385**
Modern Transport, No. 761, October 14, p. 3.
WHITELAW (W.). — Thirty-five years on the railway. **National ownership the next step?** (2 000 words.)

1933 **385 .113 (.43)**
Modern Transport, No. 761, October 14, p. 4.
German National Railway in 1932. Conditions worse than in previous year. (2 200 words & 1933.)

1933 **621 .43 (.43)**
Modern Transport, No. 761, October 14, p. 5.
A trip on the « Flying Hamburger ». (1 400 words.)

1933 **385 .21 (.71)**
Modern Transport, No. 761, October 14, p. 7.
Railways and waterways in Canada. (2 400 words.)

1933 **656 .23**
Modern Transport, No. 761, October 14, p. 9.
Accounting procedure for road transport. (1 30 words & fig.)

1933 **385. (07**
Modern Transport, No. 762, October 21, p. 3.
HALLSWORTH (H. M.). — **Education for trans**port. Should institute examination standard be raised (2 200 words.)

1933 **621 .335 (.47**
Modern Transport, No. 762, October 21, p. 5.
Electric locomotives in the U. S. S. R. — Standar design for **freight service.** (1 600 words & fig.)

1933 **65**
Modern Transport, No. 762, October 21, p. 6.
HASTIE (A.). — **Organisation of a transport de**partment. The Railway Traffic Section — roa vehicle fleets or bulk contracts. (2 200 words.)

1933 **656 .212.6 (.43) & 656 .261 (.43**
Modern Transport, No. 762, October 21, p. 8.
Loading and unloading bulk material. (600 word & fig.)

1933 **621 .43 (064 (.42**
Modern Transport, No. 762, October 21, p. 9.
Commercial vehicles for Olympia. (2 400 words.)

1933 **656**
Modern Transport, No. 763, Octobre 28, p. 9.
Transport requirements overseas : an anthology o authoritative opinion. — From the High Commissione and Agents-General of the British Dominions. (7 40 words.)

1933 **65**
Modern Transport, No. 763, October 28, p. 11.
WOOD (W. V.). — **The railways and road trans**port. **Review of recent progress.** (2 400 words.)

1933 **385 (.064 (.73) & 621 .132.3 (.42**
Modern Transport, No. 763, October 28, p. 15.
VAN SANT (R. M.). — **The « Royal Scot » in North America.** (2 100 words.)

1933 **621 .13**
Modern Transport, No. 763, October 28, p. 16.
Locomotive running. Advantage of through working (1 200 words.)

1933 **621 .43 (.42**
Modern Transport, No. 763, October 28, p. 19.
New **streamlined railcar** for Great Western Railway (1 200 words & fig.)

Railway Age. (New York.)

1933 **625 .111 (.73**
Railway Age, No. 11, September 9, p. 359.
Depresses tracks formerly elevated to **eliminate grade crossings.** (2 800 words & fig.)

1933 **621 .43 (.73) & 665 .882 (.73)**
ailway Age, No. 11, Septembery 9. p. 363.
CHAPMEN (E.). — **Welded structures reduce Diesel gine weights.** (3 200 words & fig.)

1933 **656 .257 (06 (.73)**
ailway Age, No. 11, September 9, p. 371.
Railway Accounting Officers' Association meets in icago. (6 900 words.)

1933 **625 .232**
ailway Age, No. 12, September 16, p. 395.
Are the railways capitalizing on Pullman service ? affic development series. Article No. 8. (4 000 words fig.)

1933 **313 : 625 .142.2 (.73) & 313 : 625 .173 (.73)**
ailway Age, No. 12, September 16, p. 399.
Marked reductions in **tie-renewals.** (700 words & tables.)

1933 **625 .234 (.73)**
ailway Age, No. 12, September 16, p. 402.
PERKINSON (T. F.) & SAHLMANN (F. L.). — eneral electric **air conditioning** for Pennsylvania ner. (2 400 words & fig.)

1933 **385 .113 (.42)**
ailway Age, No. 12, September 16, p. 406.
LOCK (C. S.). — **British railways forge ahead.** (4 000 ords & fig.)

1933 **625 .253 (.73) & 656 .222.1 (.73)**
ailway Age, No. 13, September 23, p. 424.
SILLCOX (L. K.). — Influence of the **A. B. brake freight-train operation.** (5 500 words & fig.)

1933 **656 .237 (.73) & 657 (.73)**
ailway Age, No. 13, September 23, p. 429.
How fifty railroads handle **stores expense.** (9 200 ords & fig.)

1933 **621 .138.2 (.73) & 725 .33 (.73)**
ailway Age, No. 13, September 23, p. 435.
Use **wrought iron plates in coaling plant.** 650 words fig.)

1933 **656 .261 (.73)**
ailway Age, No. 13, September 23, p. 439.
Lost traffic recovered by Missouri Pacific trucks. 800 words & fig.)

1933 **656 .261 (.73)**
ailway Age, No. 13, September 23, p. 441.
Railroad agents and shippers comment on **store-door** rvice. (3 400 words.)

1933 **656 .23 & 659**
ilway Age, No. 14, September 30, p. 457.
Is railway passenger service properly sold? — Traffic velopment series. Article No. 9. (5 000 words & fig.)

1933 **625 .111**
ilway Age, No. 14, September 30, p. 461.
Speed and bridge design feature grade separation oject. (3 000 words & fig.)

1933 **621 .131.2 & 621 .132.8**
Railway Age, No. 14, September 30, p. 465.
High-pressure condensing steam locomotive design proposed in Fuel Association Committee report. (2 400 words & fig.)

1933 **383 .3 (.73)**
Railway Age, No. 14, September 30, p. 468.
EASTMAN (J. B.). — **The work of the Federal Co-ordinator.** (4 300 words & fig.)

1933 **621 .43 (.73)**
Railway Age, No. 14, September 30, p. 489.
Pullman light-weight rail car designed for high speeds. (1 200 words & fig.)

1933 **656 .253 (.73)**
Railway Age, No. 15, October 7, p. 491.
Use dwarf signals as automatics. (1 000 words & fig.)

1933 **389 & 625 .245**
Railway Age, No. 15, October 7, p. 493.
The latest in **master track scales.** (1 900 words & fig.)

1933 **347 .763 (.73) & 656 .261 (.73)**
Railway Age, No. 15, October 7, p. 494.
Experiment in **store-door service** welcomed by Co-ordinator. (3 800 words.)

1933 **656 .211.5 (.725)**
Railway Age, No. 15, October 7, p. 497.
A novel **train announcing board.** (600 words & fig.)

1933 **621 .43 (.73) & 656 .27 (.73)**
Railway Age, No. 15, October 7, p. 503.
Rail motor cars pay out in 22 months. (1 400 words & fig.)

1933 **625 .111 (.73)**
Railway Age, No. 17, October 21, p. 550.
Long Island is completing another large **grade separation project.** (3 000 words & fig.)

1933 **385**
Railway Age, No. 17, October 21, p. 555.
DUNN (S. O.). — **The future of the railways** (6 000 words.)

1933 **656 .283 (.73)**
Railway Age, No. 17, October 21, p. 559.
Report on **Binghamton collision.** (1 700 words & fig.)

1933 **621 .43 (.73)**
Railway Age, No. 17, October 21, p. 561.
Four Wheel Drive Auto Co. **high-speed rail bus.** (500 words & fig.)

1933 **656 .1 (.73) & 656 .261 (.73)**
Railway Age, No. 17, October 21, p. 564.
SUNDSTROM (S. R.). — **The story of the Pennsylvania Greyhound Lines.** (3 900 words & fig.)

1933 **659**
Railway Age, No. 16, October 14, p. 518.
What can advertising do to promote passenger business? (3 200 words & fig.)

1933 **621 .139 & 656 .233**
Railway Age, No. 16, October 14, p. 527.
Reciprocal buying of coal condemned. (3 900 words.)

1933 **621 .43 (.73)**
Railway Age, No. 16, October 14, p. 531.
MURPHY (T. H.). — Westinghouse builds **Diesel locomotive for transfer service.** (1 300 words, 1 table & fig.)

Railway Engineer. (London.)

1933 **621 .133.3, 62. (01 & 669 .1**
Railway Engineer, October, p. 290.
Ageing in boiler steels. (800 words.)

1933 **621 .33 (.439)**
Railway Engineer, October, p. 291.
Hungarian main-line electrification. (3 900 words & fig.)

1933 **625 .2 (01 (.943) & 625 .29 (.943)**
Railway Engineer, October, p. 298.
RENTON (C.) & DOAK (W. J.). — **Oscillation of railway carriages on long bridges** in Queensland. (3 200 words & fig.)

1933 **621 .132.5 (.73) & 621 .134.3 (.73)**
Railway Engineer, October, p. 303.
POULTNEY (E. C.). — **High-pressure triple-expansion locomotive.** (4 200 words, 1 table & fig.)

1933 **621 .134.1**
Railway Engineer, October, p. 308.
The performance of crank pin journals. (1 000 words.)

1933 **621 .35 & 625 .233**
Railway Engineer, October, p. 309.
Alkaline accumulators for train lighting. (2 700 words & fig.)

1933 **621 .138.1 (.42) & 725 .33 (.42)**
Railway Engineer, October, p. 312.
New **locomotive depot** at Thornton, L. N. E. R. (1 500 words & fig.)

1933 **621 .9 (.42)**
Railway Engineer, October, p. 315.
New **machine tools** for railway shops. (3 000 words & fig.)

Railway Engineering and Maintenance. (Chicago.)

1933 **693**
Railway Engineering & Maintenance, September, p. 415.
How to repair deteriorated concrete. (2 000 words & fig.)

1933 **621 .133.7 (.73) & 725 .33 (.7**
Railway Engineering & Maintenance, September, p. 4
COUGHLAN (R. E.). — Large **water treating pla** embodies new features. (2 000 words & fig.)

1933 **625 .143.3 & 625 .14**
Railway Engineering & Maintenance, September, p. 4
PEABODY (J. A.). — **What is rail batter?** (3 words & fig.)

Railway Gazette. (London.)

1933 **621 .132.3 (.5**
Railway Gazette, No. 11, September 15, p. 379.
Testing standard locomotives in India. (500 wor tables & fig.)

1933 **625 .144.4 (.42) & 625 .172 (.4**
Railway Gazette, No. 11, September 15, p. 383.
Labour saving on the permanent way. (500 wo & fig.)

1933 **656 .1 (.4**
Railway Gazette, No. 12, September 22, p. 410.
The L. M. S. — Northern Counties Committee ro **services.** (2 400 words & fig.)

1933 **656 .1 (.4**
Railway Gazette, No. 12, September 22, p. 415.
Outsize loads. (600 words & fig.)

1933 **625 .245 (.44) & 656 .1 (.4**
Railway Gazette, No. 12, September 22, p. 416.
The Willeme-Coder **road-rail wagon.** (350 words fig.)

1933 **621 .43 (.4**
Railway Gazette, No. 12, September 22, p. 418.
Breda **petrol-engined railcar.** (500 words & fig.)

1933 **621 .94 (.4**
Railway Gazette, No. 12, September 22, p. 419.
New ward **hexagon turret lathe for bar work.** (words & fig.)

1933 **625 .235 (.4**
Railway Gazette, No. 13, September 29, p. 441.
A weatherproof balanced **railway carriage windo** (900 words & fig.)

1933 **621 .131.3 (.44 + .65) & 621 .13 (.44 + .6**
Railway Gazette, No. 13, September 29, p. 443.
The high-speed **Beyer-Garratt locomotive.** (5 words & fig.)

1933 **621 .43 (.4**
Railway Gazette, No. 13, September 29, p. 450.
The **Bugatti high-speed railcar.** (600 words & fi

1933 **625 .175 (.4**
Railway Gazette, No. 13, September 29, p. 451.
A British-built **gang motor trolley.** (1 300 wo & fig.)

1933 **385. (01**
ilway Gazette, No. 13, September 29, p. 456.
Colonial Railways. (2 000 words.)

1933 **651 (.42)**
ilway Gazette, No. 14, October 6, p. 477.
HALL (H.). — **Paybill mechanisation** in the engin-rs' department, L. N. E. R. (3 200 words & fig.)

1933 **624 .8 (.42)**
ilway Gazette, No. 14, October 6, p. 483.
Electricial operation of road gates. (1 600 words fig.)

1933 **621 .132.3 (.43) & 621 .134.4 (.43)**
ilway Gazette, No. 14, October 6, p. 485.
4-6-2 **four-cylinder compound locomotives,** German ate Railways. (500 words & fig.)

1933 **621 .135.2 (.44)**
ilway Gazette, No. 14, October 6, p. 486.
New design of **cast-steel wheel centre.** (400 words fig.)

1933 **656 .251 (.43)**
ilway Gazette, No. 15, October 13, p. 525.
SASSE (H. W.). — The **signalling of speed restric-ons** on the German State Railways. (1 800 words fig.)

1933 **656 .222.6 (.42) & 656 .261 (.42)**
ilway Gazette, No. 15, October 13, p. 529.
The genesis of the container. (1 400 words & fig.)

1933 **385. (01 (.55)**
ilway Gazette, No. 15, October 13, p. 531.
Railway developments in Persia. (1 300 words & fig.)

1933 **385**
ilway Gazette, No. 15, October 13, p. 535.
WHITELAW (W.). — **Thirty-five years on the rail-ay — and after.** (2 000 words.)

1933 **656 .283**
ilway Gazette, No. 15, October 13, p. 537.
Ministry of Transport **accident report.** — Victoria, outhern Railway : 26 April 1933. (4 700 words.)

1933 **656 .222.6 (.42) & 656 .261 (.42)**
ilway Gazette. No. 15, October 13, p. 541.
Road-rail containers. (900 words & table.)

1933 **621 .137 & 621 .138**
ilway Gazette, No. 16, October 20, p. 559.
The more efficient use of locomotives. (5 400 words fig.)

1933 **625 .244 (.439)**
ilway Gazette, No. 16, October 20, p. 565.
Refrigerator vans of the Hungarian State Railways. 800 words & fig.)

1933 **656 .281 (.42) & 656 .283 (.42)**
Railway Gazette, No. 16, October 20, p. 572.
Ministry of Transport **accident report.** — Raynes Park, Southern Railway : 25 May, 1933. **(Derailment and collision).** (1 500 words.)

1933 **621 .43 (064 (.42)**
Railway Gazette, No. 16A, October 27, p. 591.
Railways and road transport section. — The Commercial **Motor Transport Exhibition.** (Olympia — London). (3 600 words & fig.)

1933 **625 .175 (.68)**
Railway Gazette, No. 16A, October 27, 599.
Gang trolleys for South Africa. (500 words & fig.)

1933 **625 .4 (.44) & 656 .253 (.44)**
Railway Gazette, No. 17, November 3, p. 643.
Signalling on the Paris Metro. (4 200 words & fig.)

1933 **621 .134.2**
Railway Gazette, No. 17, November 3, p. 648.
A **valve gear improvement in Nigeria.** (500 words & fig.)

1933 **656 .212.6 (.42) & 656 .212.7 (.42)**
Railway Gazette, No. 17, November 3, p. 649.
Mechanisation of L. M. S. R. goods depots. (300 words & fig.)

1933 **625 .151 (.42)**
Railway Gazette, No. 17, November 3, p. 650.
Novel switch lever and indicator. (800 words & fig.)

1933 **656 .212.6 (.42)**
Railway Gazette, No. 17, November 3, p. 652.
Travelling and shunting cranes at Hayes creosoting works, G. W. R. (350 words & fig.)

1933 **656 .283 (.42)**
Railway Gazette, No. 17, November 3, p. 656.
Ministry of Transport **accident report.** — Crich Junction, London Midland & Scottish Railway, 17 June, 1933. (2 300 words & fig.)

1933 **621 .43 (.82)**
Diesel Railway Traction, p. 498, Supplement to the Railway Gazette, October 6.
Heavy shunting locomotives for harbour work. (1 000 words & fig.)

1933 **621 .335 (.43) & 621 .43 (.43)**
Diesel Railway Traction, p. 500, Supplement to the Railway Gazette, October 6.
Powerful new railcars for German State Railway. (850 words & fig.)

1933 **621 .43**
Diesel Railway Traction, p. 501, Supplement to the Railway Gazette, October 6.
LOMONOSSOFF (G.). — **Diesel traction.** (3 000 words & fig.)

1933 **621 .43**
Diesel Railway Traction, p. 504, Supplement to the Railway Gazette, October 6.
HARDY (A. C.). — **A « Diesel boiler ».** (1 900 words & fig.)

1933 **621 .43 (.8)**
Diesel Railway Traction, p. 506, Supplement to the Railway Gazette, October 6.
REED (B.). — Development of **Diesel traction.** (1 600 words, 1 table & fig.)

1933 **621 .43**
Diesel Railway Traction, p. 509, Supplement to the Railway Gazette, October 6.
MIALL (S.). — **Transmissions for Diesel locomotives and railcars. The Lysholm-Smith transmission.** (1 400 words & fig.)

1933 **621 .335 (.42) & 621 .43 (.42)**
Diesel Railway Traction, p. 510, Supplement to the Railway Gazette, October 6.
Another British **Diesel locomotive.** (300 words & fig.)

1933 **621 .43 (.43)**
Diesel Railway Traction, p. 511, Supplement to the Railway Gazette, October 6.
A successful **Diesel loco-tractor.** (600 words & fig.)

1933 **621 .43 (.436)**
Diesel Railway Traction, p. 512, Supplement to the Railway Gazette, October 6.
Railcar development in Austria. (1 500 words & fig.)

1933
Diesel Railway Traction, p. 668, Supplement to the Railway Gazette, November 3.
Universal Diesel locomotive for British conditions. (1 500 words & fig.)

1933 **621 .43**
Diesel Railway Traction, p. 671, Supplement to the Railway Gazette, November 3.
An advance in **Diesel locomotive practice.** (700 words & fig.)

1933 **621 .43 (.42)**
Diesel Railway Traction, p. 672, Supplement to the Railway Gazette, November 3.
Diesel railcar for the Great Western Railway (900 words & fig.)

1933 **621 .43 (.42)**
Diesel Railway Traction, p. 674, Supplement to the Railway Gazette, November 3.
Diesel shunting locomotive (with mechanical transmission) for the L. M. S. R. (750 words, 1 table & fig.)

1933 **621 .43**
Diesel Railway Traction, p. 676, Supplement to the Railway Gazette, November 3.
MIALL (S.). — **Transmissions for Diesel locomotives and railcars.** (800 words & fig.)

1933 **621 .43 (**
Diesel Railway Traction, p. 679, Supplement to Railway Gazette, November 3.
REED (B.). — **Development of Diesel traction.** (2 words & fig.)

1933 **621 .43 (.4**
Diesel Railway Traction, p. 681, Supplement to Railway Gazette, November 3.
Extension of Diesel traction in Europe. (1 000 wo & fig.)

1933 **621**
Electric Railway Traction, p. 618, Supplement to Railway Gazette, October 27.
SMITH (R. T.). — The present position of elec railway traction. (3 100 words.)

1933 **621 .**
Electric Railway Traction, p. 620, Supplement to Railway Gazette, October 27.
Electric locomotive wheel arrangements. (700 wor

1933 **621 .338 (.**
Electric Railway Traction, p. 621, Supplement to Railway Gazette, October 27.
New rolling-stock for Euston-Watford line. (2 words & fig.)

1933 **621 .33 (.**
Electric Railway Traction, p. 625, Supplement to Railway Gazette, October 27.
L. N. E. R. suburban electrification. (1 500 wo & map.)

1933 **621 .33 (.4**
Electric Railway Traction, p. 627, Supplement to Railway Gazette, October 27.
The Copenhagen suburban electrification. (1 words & fig.)

1933 **621 .**
Electric Railway Traction, p. 631, Supplement to Railway Gazette, October 27.
Recent pantograph designs. (800 words & fig.)

Railway Magazine. (London.)

1933 **625 .232 (09 (.**
Railway Magazine, September, p. 177.
ELLIS (H.). — **The sleeping car : Sixty years' velopment.** (3 600 words & fig.)

1933 **621 .132.3 (.42 + .**
Railway Magazine, September, p. 185.
The « Royal Scot » in America. (1 500 words & fi

1933 **385. (091 (.**
Railway Magazine, September, p. 189.
The Great Indian Peninsula Railway. (1 600 wo & fig.)

1933 **656 .222.1 (.4)**
Railway Magazine, September, p. 200.
Continental Summer train services, 1933. (2 800 words & tables.)

1933 **385.** (091 (.47 + .57)
Railway Magazine, October, p. 245.
RUSSELL (Capt. W. P. M.). — **From Manchukuo to Moscow.** (400 words & fig.)

1933 **656 .222.1 (.42)**
Railway Magazine, September, p. 263.
The fastest trains in Great Britain, 1933. (2 400 words & tables.)

1933 **656 .222.1 (.42)**
Railway Magazine, November, p. 327.
ALLEN (C. J.). — **British locomotive practice and performance.** (3 700 words, tables & fig.)

1933 **656 .222.1 (.42)**
Railway Magazine, November, p. 342.
British train services in the summer of 1933. (2 200 words & tables.)

Railway Mechanical Engineer. (Philadelphia.)

1933 **621 .43 (.73)**
Railway Mechanical Engineer, September, p. 309.
Austro-Daimler rail car utilizes « wheels-on-air ». (1 800 words & fig.)

1933 **625 .245 (.73)**
Railway Mechanical Engineer, September, p. 314.
Delaware & Hudson rebuilds cars of handling cement. (800 words & fig.)

1933 **621 .135.4**
Railway Mechanical Engineer, September, p. 315.
BURDICK (W. E.). — **Geometrical analysis of locomotive curving action.** (1 300 works & fig.)

1933 **621 .135.3**
Railway Mechanical Engineer, September, p. 318.
McCALL (K. F.). — **Principles in the design of locomotive spring rigging.** (3 300 words & fig.)

1933 **625 .214**
Railway Mechanical Engineer, September, p. 323.
The preparation of car journal bearings. (1 300 words & fig.)

1933 **625 .212 (.73) & 625 .26 (.73)**
Railway Mechanical Engineer, September, p. 330.
EDWARDS (E. C.). — **Gaging car wheels.** (2 300 words & fig.)

1933 **625 .253 & 656 .222.6**
Railway Mechanical Engineer, October, p. 345.
Report of road tests of AB freight brake. (5 500 words & fig.)

1933 **621 .392 & 621 .43**
Railway Mechanical Engineer, October, p. 353.
CHAPMAN (E.). — **Welded steel Diesel structures.** (4 000 words & fig.)

1933 **621 .131.2**
Railway Mechanical Engineer, October, p. 357.
Ratios of modern locomotives. (9 200 words & tables.)

1933 **621 .43 (.73) & 625 .232 (.73)**
Railway Mechanical Engineer, November, p. 383.
Texas and Pacific receives light-weight stainless-steel passenger train. (2 700 words & fig.)

1933 **625 .243 (.73) & 625 .246 (.73)**
Railway Mechanical Engineer, November, p. 389.
First standard steel-sheated box cars go into service. (1 000 words & fig.)

1933 **621 .131.2**
Railway Mechanical Engineer, November, p. 390.
VINCENT (H. S.). — **Ratios of modern locomotives.** (Discussion of paper by Mr. Lipetz). Part I. (4 000 words & fig.)

1933 **621 .335 (.73) & 621 .43 (.73)**
Railway Mechanical Engineer, November, p. 395.
Burlington Diesel-electric switchers. (2 000 words & fig.)

Railway Signaling. (Chicago.)

1933 **621 .39 (.73) & 656 .25 (.73)**
Railway Signaling, September, p. 237.
Capacitors used on the Norfolk & Western. (2 200 words & fig.)

1933 **625 .162 (.73) & 656 .259 (.73)**
Railway Signaling, September, p. 240.
Highway-crossing signals on the Canadian National. (2 000 words & fig.)

1933 **656 .253 (.73)**
Railway Signaling, September, p. 243.
Remote control replaces interlocking. (1 100 words & fig.)

1933 **656 .258 (.73)**
Railway Signaling, September, p. 245.
Interlocking for new bridge on the Louisville & Nashville. (800 words & fig.)

1933 **656 .253 (.73)**
Railway Signaling, September, p. 247.
Dwarf signals used as automatics. (1 600 words & fig.)

1933 **621 .39 (.73) & 656 .253 (.73)**
Railway Signaling, September, p. 249.
D.-C. signaling with A.-C. power. (900 words & fig.)

1933 **656 .257 (.73)**
Railway Signaling, September, p. 251.
Consolidating interlockings and block offices. (2 300 words, 1 table & fig.)

Transit Journal. (New York.)

1933 **625 .62 & 656 .25**
Transit Journal, October, p. 301.
Visualizing headways. (1 500 words & fig.)

1933 **621 .338 (.73)**
Transit Journal, October, p. 306.
Louisville completing **car conversion program.** 79 per cent of all **motor cars changed for one-man service.** (600 words & fig.)

1933 **621 .392 & 625 .173**
Transit Journal, October, p. 314.
Reclaiming manganese steel special work by welding. (400 words & fig.)

1933 **388 (06 (.73)**
Transit Journal, No. 11, October 10, p. 331.
Convention in print. Summary of the address and discussions at the **52nd. Annual Convention of the American Transit Association.**

South African Railways and Harbours Magazine. (Johannesburg.)

1933 **625 .232 (.68)**
South African Rys. and Harbours Mag., October, p. 1123.
A new type of **dining car.** (1 400 words & fig.)

The Locomotive. (London.)

1933 **621 .132.6 (.56)**
The Locomotive, No. 494, October 14, p. 287.
Fast passenger tank locomotive for the Turkish Railways. (1 500 words & fig.)

1933 **385. (01**
The Locomotive, No. 494, October 14, p. 289.
Institution of Locomotive Engineers. **Colonial railways.** Presidential address of Major C. E. WILLIAMS, C. B. E., delivered in the lecture hall of the Institution of Civil Engineers, on 28 September 1933. (1 000 words & fig.)

1933 **621 .335 (.65) & 621 .43 (.65)**
The Locomotive, No. 494, October 14, p. 290.
750 h. p. **Diesel-electric locomotive.** P. L. M. Railway (Algerian lines). (900 words & fig.)

1933 **625 .232 (.492)**
The Locomotive, No. 494, October 14, p. 300.
Welded main-line coaches in Holland. (900 words & fig.)

1933 **621 .43**
The Locomotive, No. 494, October 14, p. 301.
Diesel locomotive and cars. (900 words & fig.)

1933 **625 .151**
The Locomotive, No. 494, October 14, p. 303.
« Monarch » improved point lever and three-position indicator. (800 words & fig.)

1933 **621 .133.1 & 621 .**
The Locomotive, No. 494, October 14, p. 314.
Diesel fuel oils. (800 words.)

In Spanish.

Ferrocarriles y Tranvias. (Madrid.)

1933 **656 .283 (.48**
Ferrocarriles y Tranvias, octubre, p. 358.
HARD (T.). — La **señalización** de la estación centr de Gotemburgo. (5 500 palabras & fig.)

1933 **625 .2**
Ferrocarriles y Tranvias, octubre, p. 366.
STRAUSS (F.). — **Frenos continuos automátic** para trenes de mercancías. (1 900 palabras & fig.)

1933 **621 .53 (.46**
Ferrocarriles y Tranvias, noviembre, p. 384.
VALENTI DE DORDA (J.). — Estudio económi de la **electrificación** de las lineas de Madrid a Av y Segovia, de la Compañía de los Ferrocarriles Norte. (5 800 palabras & fig.)

1933 **385 (.46**
Ferrocarriles y Tranvias, noviembre, p. 390.
MORENO (R. S.). — La **racionalización** en los fer carriles españoles. (7 000 palabras & fig.)

Gaceta de los Caminos de hierro. (Madrid.)

1933 **621 .43 (.4**
Gaceta de los Caminos de hierro, nº 3703, 1º de octub p. 109.
La **automotriz Bugatti.** (5 200 palabras.)

Ingenieria y Construcción. (Madrid.)

1933 **621**
Ingenieria y Construcción, octubre, p. 523.
SIEGRIST (E.). — **Los automotores a gasoli** (4 200 palabras & fig.)

Revista de Ingenieria Industrial. (Madrid.)

1933 **621 .33 (.46**
Revista de Ingenieria Industrial, octubre, p. 328.
DE COS (F.). — Lo que podría ser un progra nacional de **electrificación** de ferrocarriles. (4 400 labras.)

Revista de Obras Publicas. (Madrid.)

1933 **624**
Revista de Obras Publicas, nº 19. 1º de octubre, p. 4
FERNANDEZ CASADO (C.). — **Teoria del ar** (4 100 palabras & fig.)

1933 **624 .63 (.460)**

Revista de Obras Publicas, n° 20, 15 de octubre, p. 433.

VILLALBA GRANDA (C.). — El **puente** sobre el ío Guadiana, en Villanueva de la Serena. (4 700 palabras & fig.)

1933 **624 .6**

Revista de Obras Publicas, n° 21, 1° de noviembre, p. 457.

CASADO (C. F.). — **Teoria del arco.** (1 800 palabras, 5 cuadros.)

1933 **621 .33**

Revista de Obras Publicas, n° 21, 1° de noviembre, p. 461.

CUERVO (L. S.). — Presente y porvenir de las **electrificaciones ferroviarias.** (3 900 palabras, 2 cuadros & fig.)

In Italian.

Annali dei lavori pubblici. (Roma.)

1933 **621 .33**

Annali dei lavori pubblici, giugno, p. 496.

BAJOCCHI (U.). — Il ricupero d'energia nella trazione **elettrica.** (15 000 parole & fig.)

La tecnica professionale. (Firenze.)

1933 **656 .22**

La tecnica professionale, novembre, p. 317.

Quali sono gli elementi essenziali che influiscono sul costo **della fermata di un treno.** (3 000 parole & fig.)

L'Ingegnere. (Roma.)

1933 **625 .143. (0**

L'Ingegnere, ottobre, p. 736.

STABILINI (L.). — **L'inflessione laterale delle botaie.** (1 800 parole & fig.)

1933 **669 .1**

L'Ingegnere, novembre, p. 805.

TANSINI (I.). — **Proprietà meccaniche degli acciai nitrurati.** (2 000 parole, diagr. & 4 quadri.)

Rivista tecnica delle ferrovie italiane. (Roma.)

1933 **621 .131**

Rivista tecnica delle ferrovie italiane, 15 settembre, p. 123.

MAFFEZZOLI (A.). — Linee secondo cui si svolge il progresso delle **locomotive a vapore.** (16 700 parole & fig.)

1933 **621 .133.7**

Rivista tecnica delle ferrovie italiane, 15 settembre, p. 168.

MICHELUCCI (A.). — **Sul trattamento dell' acqua** nell' interno delle caldaie delle locomotive e sui fenomeni di ebollizione tumultuosa. (4 900 parole & fig.)

1933 **625 .1 (.44)**

Rivista tecnica delle ferrovie italiane, 15 ottobre, p. 201.

La **ferrovia** Adria-Ariano Polesine. (1 600 parole & fig.)

1933 **621 .33 (.73)**

Rivista tecnica delle ferrovie italiane, 15 ottobre, p. 207.

HUG (A.). — **Elettrificazione** della ferrovia New York-Washington. (1 100 parole & fig.)

1933 **669**

Rivista tecnica delle ferrovie italiane, 15 ottobre, p. 210.

AZZARELLO (E.) & ACCARDO. — Determinazione rapida del rame **nei metalli bianchi** per precipitazione diretta in presenza di stagno, antimonio, piombo, ecc. (2 700 parole.)

In Dutch.

De Ingenieur. (Den Haag.)

1933 **656 .21 (.492)**

De Ingenieur, N^r 38, 22 September, p. V. 67.

DE KANTER (N. M.) & BIEMOND (C.). — Verbetering **van de spoorweg- en verkeerstoestanden** te Amsterdam-Oostzijde. (13 800 woorden, fig. & kaart.)

1933 **62. (01 & 691**

De Ingenieur, N^r 40, 6 October, p. Bt. 27.

RENGERS (N. J.). — Proefnemingen op **kolommen van beton en gewapend beton.** (1 200 woorden & 14 tabellen & fig.)

1933 **669 .1**

De Ingenieur, N^r 41, 13 October, p. W. 193.

WAEHLERT (M.) & HANEL (R.). — Perlietisch, martensietisch en austenietisch **gietijzer.** (3 800 woorden, 2 tafereelen & fig.)

1933 **656 (.92)**

De Ingenieur, N^r 45, 10 November, V. 97.

VAN AMEYDEN-VAN DUYM (D.). — **Tram en autobus in Oost-Java.** (6 900 woorden & 1 kaart.)

1933 **625 .251**

De Ingenieur, N^r 45, 10 November, p. V. 105.

Automatische remdrukinstelling bij beladen spoorwagens. (1 000 woorden & fig.)

Spoor- en Tramwegen. (Utrecht.)

1933 **656 .21 (.492)**

Spoor en Tramwegen, N^r 20, 26 September, p. 513; N^r 21, 10 October, p. 556.

DE KANTER (N. M.). — Verbetering van de **Spoorweg- en Verkeerstoestanden** Amsterdam-Oostzijde. (4 500 woorden, kaarten & fig.)

1933 **621 .43**

Spoor en Tramwegen, N^r 21, 10 October, p. 547.

BERG (G. F.). — **Diesel locomotieven.** (4 600 woorden.) (Wordt vervolgd.)

1933 **656**

Spoor en Tramwegen, Nr 21, 10 October, p. 559.

SIMON-THOMAS. — **Verkeersregeling...** en nog wat. (2 900 woorden.) (Slot volgt.)

1933 **621 .132.8 (.492)**

Spoor en Tramwegen, Nr 22, 24 October, p. 571.

BRUNNER (H.). — De 71.5 tons « **Garratt** »-**locomotief** van de Limburgsche Tramweg Maatschappij. (2 800 woorden & fig.)

1933 **656**

Spoor en Tramwegen, Nr 22, 24 October, p. 574.

SIMON-THOMAS (W.). — **Verkeersregeling...** en nog wat. (1 900 woorden.)

1933 **621 .43**

Spoor en Tramwegen, Nr 22, 24 October, p. 578; Nr 23, 7 November, p. 602.

BERG (G. F.). — **Diesel locomotieven.** (4 400 woorden.)

1933 **625 .1 (.492)**

Spoor en Tramwegen, Nr 23, 7 November, p. 597.

De **nieuwe lijn** Brussel-Zuid-Denderleeuw. (1 500 woorden & fig.)

In Portuguese.

Boletim do Instituto de Engenharia. (S. Pau (Brasil.)

1933 **621 .335**

Boletim do Instituto de Engenharia, setembro, p.

ORLANDO D. MURGEL. — Construcção de **automotriz electrica** para passageiros nas offi da E. F. Campos do Jordão, em Pindamonhan (1 400 palavras & fig.)

Revista das Estradas de ferro. (Rio de Jane

1933 **621 .1**

Revista das Estradas de ferro, nº 198, 15 de out p. 271.

Modernas tendencias da **tracção ferroviari.** palavras & fig.)

15.760. — M. Weissenbruch Co., Ltd., Printer of the King, 49, rue du Poinçon, Bruxelles.

MONTHLY BIBLIOGRAPHY OF RAILWAYS [1].

PUBLISHED UNDER THE SUPERVISION OF

P. GHILAIN,

General Secretary of the Permanent Commission of the International Railway Congress Association.

FEBRUARY (1934)

[016. 385. (02]

I. — BOOKS.

In French.

1933 621 .89
NCEAU.
Manuel de graissage.
Paris, J. B. Baillière & Fils. 1 volume, 336 pages et 0 figures. (Prix: 22 francs français.)

1933 621 .135.4, 625 .215 & 656 .281
ONSTANTIN (Celoiu), ingénieur en mécanique.
Théorie mécanique du déraillement et calcul des ogies.
Bruxelles, Arts et Métiers, Editions techniques, 64, e Jean d'Ardenne. 1 vol. (24×14 cm.) de 176 pages, ec 23 figures. (Prix: 75 fr. belges.)

1933 621 .132.8 & 621 .43
RANCO & LABRYN (P.).
Locomotives et automotrices à moteurs à combus- on interne.
Liége, 1, quai de la Grande-Bretagne. Librairie Poly- chnique Ch. Béranger. 1 volume, 268 pages et 185 gures. (Prix: fr. belges 112.50.)

1933 621 .337
UG (A. M.).
La commande individuelle des essieux de locomo- ves électriques.
Zurich, Editions Orell Fussli, 31, avenue de la Gare. volume, 100 pages et 150 figures. (Prix: 25 francs isses.)

1933 624 .9
ABARRAQUE (P.).
Manuel de charpente en fer.
Paris (VI[e]), J. B. Baillière & Fils, 19, rue Haute- uille. 1 volume, 410 pages et 395 figures. (Prix: francs français.)

1933 624 .2
AGNEL (G.).
Le calcul pratique des poutres Vierendeel.
Gand, Van Rysselberghe & Rombaut. 1 volume, 120 pages et 22 planches hors texte. (Prix: 200 francs belges.)

1933 313 .385 (.437)
Statistique des Chemins de fer tchécoslovaques pour 1932.
Praha, Ministère des Communications. 1 volume, 154 pages et 1 carte.

1933 385. (09.3 (.44)
Une étape de la construction des grandes compagnies de chemins de fer en France. La ligne de Paris à la frontière d'Allemagne (1825-1852).
Paris, Dorbon, aîné, 19, boulevard Haussmann. 4 volumes, ensemble 1 030 pages, 104 figures. (Prix : 240 francs français.)

In German.

1933 691 (.43)
GEHLER (W.).
Erläuterungen zu den Eisenbeton-Bestimmungen 1932 mit Beispielen.
Leipzig, Johann Ambrosius Barth und Brüssel, Falk, Fils, 22, rue des Paroissiens. 1 Band, 320 Seiten und 104 Abbildungen. (Preis: 10 R.M.)

1933 62. (01 & 721 .9
GRAF (O.).
Versuche über die Widerstandsfähigkeit von Eisenbetonplatten unter konzentrierter Last nahe einem Auflager und Versuche über die Widerstandsfähigkeit des Betons an den Abbiegestellen der schief abgebogenen Eisen in Eisenbetonbalken.
Leipzig, Johann Ambrosius Barth & Brüssel, Falk, Fils, 22, rue des Paroissiens. 1 Band, 28 Seiten und 39 Abbildungen. (Preis: 3.40 R.M.)

1933 62. (02
HUTTE.
Ingenieurs Taschenbuch.
Leipzig, Johann Ambrosius Barth & Brüssel, Falk, Fils, 22, rue des Paroissiens. 4 Bände, Band 3, 676 Seiten und Abbildungen. (Preis: 8.50 R.M.)

(1) The numbers placed over the title of each book are those of the decimal classification proposed by the Railway Congress conjointly with the Office Bibliographique International, of Brussels. (See « Bibliographical Decimal Classification as applied to Railway Science », by L. Weissenbruch, in the number for November 1897, of the *Bulletin of the International Railway Congress*, p. 1509).

1933 691 & 721 .9
KERSTEN (C.).
Der Eisenbetonbau.
Leipzig, Johann Ambrosius Barth und Brüssel, Falk, Fils, 22, rue des Paroissiens. 1 Band, 262 Seiten, 298 Textabbildungen, 23 Zahlentafeln und 28 Zahlenbeispielen. (Preis: 8 R.M.)

1933 69
KLEINLOGEL (A.).
Mehrstielige Rahmen.
Leipzig, Johann Ambrosius Barth & Brüssel, Falk, Fils, 22, rue des Paroissiens. 3. vollst. neubearb. und bed. erw. Aufl. in 2 Bänden. Band 2 : Hallen- und Stockwerkrahmen, 291 Seiten, 575 Abbildungen. (Preis: 24.50 R.M.)

1933 725 .31 (.43)
ROTTCHER (H.).
Empfangsgebäude der Personenbahnhöfe.
Berlin, Verlag der Verkehrswirtschaftlichen Lehrmittelgesellschaft m. b. H. bei der Deutschen Reichsbahn. 1 Band, 139 Seiten und 172 Abbildungen. (Preis: 15 R.M.)

1933 691
SALIGER (R.).
Der Eisenbeton, seine Berechnung und Gestaltung.
Leipzig, Alfred Kröner. 1 Band, 661 Seiten, 543 Abbildungen und 146 Zahlentafeln. (Preis: 28 R.M.)

1933 .665 .882
Sammelwerk der Autogen-Schweissung.
Halle/Saale, in Kommission Carl Marhold. Band 3: Stahlbau, 141 Seiten und 250 Abbildungen. (Preis: 6 R.M.)

1933 625 .113
SARRAZIN (O) & OBERBECK (H.).
Taschenbuch zum Abstecken von Kreisbogen mit und ohne Übergangsbogen für Eisenbahnen, Strassen und Kanäle.
Leipzig, Johann Ambrosius Barth und Brüssel, Falk, Fils, 22, rue des Paroissiens. 1 Band, 300 Seiten und 27 Abbildungen. (Preis: 6 R.M.)

In English.

1933 385. (08 (.
FEDERATED MALAY STATES.
Railways report for the year 1932.
Kuala Lumpur. Printed at the Federated Ma States Government Press. 86 pages, tables, fig. a map.

1933 656 .2 (.
HINSHAW (David) & ALBIG (W. Espey).
Stop, look and listen.
New York. Published by Doubleday, Doran & Inc. (9×6 inches), 293 pages. (Price: $ 2.50.)

1933 621 .3 (
McDONALD (Georges).
McDonald's electrical dictionary.
Boston, Mass. Published by Meador Publishing (5×8 inches), 178 pages. (Price: $ 1.50.)

1933 669
THUM (E. E.).
The book of stainless steels.
Cleveland, Ohio. Published by American Society Steel Treating. (6×9 inches), 631 pages, photograp line drawings and tables. (Price: $ 5.00.)

In Spanish.

1933 625 (.46
MENDOZA VILAR (A.).
Unificación del material ferroviario.
Madrid, Asociación General de transportes por férrea, Calle del Prado, 26. 1 volumen, 65 páginas figuras.

In Italian.

1933 6
SANTARELLA (L.).
Arte e tecnica nella evoluzione dei ponti.
Milan, U. Hoepli. 1 volume, 192 pagine e 280 figu (Prezzo: 22 Lire.)

[016. 385. (05

II. — PERIODICALS.

In French.

Annales des ponts et chaussées. (Paris.)

1933 624 .63 (.44)
Annales des ponts et chaussées, septembre-octobre, p. 203.
WAHL (P.) & BAUDET. — **Construction du Pont du Fourneau sur la Loire.** (6 500 mots & fig.)

1933 721
Annales des ponts et chaussées, septembre-octob p. 237.
CROUZET. — Note sur les conditions d'équilib des sables aquifères et le calcul des **fondations** da ces terrains. (5 400 mots & fig.)

1933 624
Annales des ponts et chaussées, septembre-octob p. 257.
PIETRI. — Etude sur les **ponts basculants** systè Strauss. (5 400 mots & fig.)

Bulletin de la Société d'encouragement pour l'industrie nationale. (Paris.)

1933 **385 .587**

ıll. de la Soc. d'encouragement pour l'ind. nat., novembre, p. 545.

BLOCH (M.). — **L'organisation** rationnelle dans les ines ne travaillant pas en série. (5 000 mots.)

Bulletin de la Société des ingénieurs civils de France. (Paris.)

1933 **625 .143 & 625 .212**

ıll. de la Soc. des ing. civ. de France, P. V. de la séance du 24 novembre, p. 455.

BACQUEYRISSE (L.). — **Le rail et la roue.** (4 100 ots.)

1933 **656 .1 & 656 .2**

ıll. de la Soc. des ing. civ. de France, P. V. de la séance du 24 novembre, p. 465.

MARIAGE (A.). — **Le Problème du rail et de la ute.** Résumés des thèses soutenues au cours des prédentes communications. Essai de conclusion. Vues avenir. (3 600 mots.)

Bulletin des transports internationaux par chemins de fer. (Berne.)

1933 **656**

ıll. des transp. intern. par ch. de fer, novembre, p. 467.

GIANNINI (A.). — **Les transports combinés.** (9 400 ots.)

1933 **313 .385 (.492)**

ıll. des transp. intern. par ch. de fer, novembre, p. 533.

Statistique des Chemins de fer néerlandais pour nnée 1932. (800 mots.)

ılletin technique de la Suisse romande. (Vevey.)

1933 **624 .63**

ıll. techn. de la Suisse romande, n° 26, 9 décembre, p. 305.

SARRASIN (A.). — **Ponts** récents en béton armé. 500 mots & fig.)

Chronique des transports. (Paris.)

1933 **385 (.3)**

ronique des transports, n° 23, 10 décembre, p. 3.

La situation des chemins de fer en France et à tranger. (5 000 mots.) (A suivre.)

Génie civil. (Paris.)

1933 **625 .245 (.44)**

énie civil, n° 2675, 18 novembre, p. 502.

Wagon « route et rail » en essais sur le Chemin de r du Nord, pour le transport mixte des marchandises. 00 mots & fig.)

1933 **625 .5 (.43)**

Génie civil, n° 2676, 25 novembre, p. 518.

FRANK (R.). — **Le funiculaire aérien** de Fribourg-en-Brisgau au Schauinsland. — L'accident du 26 novembre 1932. (3 900 mots & fig.)

1933 **624 .2**

Génie civil, n° 2676, 25 novembre, p. 523.

LEGENS (L.). — **Considérations sur les efforts** principaux et secondaires dans une **poutre à treillis** multiples. (1 800 mots & fig.)

1933 **669**

Génie civil, n° 2676, 25 novembre, p. 527.

Les emplois des **rayons X** dans l'auscultation des pièces métalliques. (1 200 mots & fig.)

1933 **621 .392 (.438)**

Génie civil, n° 2677, 2 décembre, p. 548.

BRYLA (S.). — **Nouvelles prescriptions polonaises** concernant les **constructions métalliques soudées.** (2 400 mots.)

1933 **624 .62 (.43)**

Génie civil, n° 2678, 9 décembre, p. 570.

DAVID (M.). — **Le renforcement du pont-route** sur le Rhin à Mayence. (2 500 mots & fig.)

1933 **62. (01 & 627**

Génie civil, n° 2678, 9 décembre, p. 573.

BARBET-MASSIN (A.). — **L'évolution** dans la construction des **conduites d'eau.** (2 400 mots & fig.)

1933 **625 .172**

Génie civil, n° 2678, 9 décembre, p. 577.

Alidade à lunette et flexomètre destinés à l'entretien des voies ferrées par « **soufflage mesuré** ». (1 500 mots & fig.)

1933 **624 .51 (.44)**

Génie civil, n° 2679, 16 décembre, p. 585.

CHADENSON (L.). — **Le nouveau pont suspendu** de Serrières sur le Rhône. (3 800 mots & fig.)

1933 **656 .1 & 656 .2**

Génie civil, n° 2679, 16 décembre, p. 594.

L'état actuel de la **question du rail et de la route** au point de vue des compagnies de chemins de fer. (2 700 mots.)

1933 **656 .1 & 656 .2**

Génie civil, n° 2679, 16 décembre, p. 596.

Le **problème du rail et de la route.** (1 700 mots.)

1933 **62. (01 & 621 .116**

Génie civil, n° 2679, 16 décembre, p. 597.

L'épreuve de rupture par pliage sur barreaux entaillés, pour l'appréciation des **tôles à chaudières.** (1 900 mots & fig.)

1933 **621 .116 (.47)**

Génie civil, n° 2679, 16 décembre, p. 600.

Les **chaudières à très haute pression,** système Löffler, de l'Institut pour la technique de la chaleur, à Moscou. (1 200 mots & fig.)

L'Allègement dans les Transports. (Lucerne.)

1933 **621 .132.8 (.45)**

L'Allègement dans les Transports, décembre, p. 130.

PELLEGRINI (M. T.). — **Treni leggeri** sulla strada ferrata di Biella. (1 300 mots & fig.)

1933 **625 .245 (.44) & 656 .225 (.44)**

L'Allègement dans les Transports, décembre, p. 134.

LEROY. — Note sur les **containers** en duralumin du chemin de fer du Nord. (700 mots & fig.)

La Science et la Vie. (Paris.)

1933 **656 .255**

La Science et la Vie, décembre, p. 486.

NETTER (J.). — La **télémécanique** simplifie l'exploitation ferroviaire. Un seul agent commande à distance aiguilles et signaux sur la voie ferrée. (1 500 mots & fig.)

Les Chemins de fer et les Tramways. (Paris.)

1933 **621 .43**

Les Chemins de fer et les Tramways, décembre, p. 287.

SPIESS (E.). — **Automotrices à pétrole.** (12 200 mots & fig.)

1933 **621 .33**

Les Chemins de fer et les Tramways, décembre, p. 297.

VALAY (E.). — Les méthodes d'étude du **mouvement des trains électriques** et leur application à la prédétermination du matériel de traction électrique et à sa bonne utilisation en service. (6 500 mots.)

1933 **625 .212**

Les Chemins de fer et les Tramways, décembre, p. 300.

Bandage pneumatique pour voie ferrée. (900 mots & fig.)

1933 **625 .173**

Les Chemins de fer et les Tramways, décembre, p. 301.

Alidade et flexomètre pour l'entretien des voies ferrées par **soufflage mesuré**. (2 700 mots & fig.)

1933 **656 .1**

Les Chemins de fer et les Tramways, décembre, p. 304.

DUCHESNOY. — Les **auto-gares.** (5 200 mots & fig.)

L'Industrie des voies ferrées et des transports automobiles. (Paris.)

1933 **625 .143.2**

L'Ind. des voies ferrées et des transp. autom., octobre, p. 313.

GRENIER (G.). — Le **traitement thermique des rails** Broca aux Usines de Neuves-Maisons. (2 200 mots & fig.)

Revue générale des chemins de fer. (Paris.)

1933 **656 .2**

Revue générale des chemins de fer, décembre, p. 4

LEMONNIER. — Première application en France la **commande centralisée** des aiguilles et des signau (3 500 mots & fig.)

1933 **625 .144.1 & 625 .173 (.4**

Revue générale des chemins de fer, décembre, p. 4

EHRMANN. — **Renouvellement du matériel de v** en rails soudés de 54 m. et du ballast dans le tun de Puberg. (3 600 mots & fig.)

1933 **385 .113 (.4**

Revue générale des chemins de fer, décembre, p. 5

Les **résultats d'exploitation** du réseau des Chemi de fer de l'Etat. (5 000 mots & fig.)

1933 **313 .385 (.4**

Revue générale des chemins de fer, décembre, p. 5

Résultats obtenus en 1932 sur les Chemins de f d'Alsace et de Lorraine. (1 500 mots.)

1933 **656 .254 (.43) & 656 .285 (.4**

Revue générale des chemins de fer, décembre, p. 5

Signalisation acoustique d'avertissement pour équ pes d'entretien de la voie. (600 mots & fig.)

Revue universelle des Mines. (Liége.)

1933 **625**

Revue universelle des mines, n° 23, 1er décembre, p. 62 n° 24, 15 décembre, p. 649.

DEWANDRE (A.). — Les **tunnels** sous l'Escaut, Anvers. (8 800 mots & fig.)

In German.

Elektrische Bahnen. (Berlin.)

1933 **621 .335 (.4**

Elektrische Bahnen, November, S. 249.

BUCHHOLD (Th.). — Die Entwicklungsgeschich der neuen 1 Do 1-Lokomotive, Reihe E 16, Betrieb nummer 18-21. (2 000 Wörter & Abb.)

1933 **621 .33 (.7**

Elektrische Bahnen, November, S. 257.

SCHMITT (H.). — **Der elektrische Betrieb der Eise** bahnen von New York. (5 000 Wörter & Abb.) (Schlu folgt.)

1933 **621 .3**

Elektrische Bahnen, November, S. 270.

LANDMANN (W.). — Der **Schiemann-Antrieb,** billiger Antrieb für Schienenschleppzeuge. (500 Wör & Abb.)

Glasers Annalen. (Berlin.)

1933 **621 .135.2 & 625 .212**

lasers Annalen, Heft 9, 1. November, S. 65.

KREISSIG (E.). — Schrumpfsitz und Beanspruchun-
en beim **Speichenrad.** (4 500 Wörter & Abb.)

1933 **624. (0 & 385. (072) (.43)**

lasers Annalen, Heft 10, 15. November, S. 74.

ROSTECK (W.). — Anwendbarkeit zerstörungsfreier
rüfverfahren im **Brückenbau** unter besonderer Berük-
chtigung der **Röntgendurchstrahlung.** (4 400 Wörter
Abb.)

Organ für die Fortschritte des Eisenbahnwesens. (Berlin.)

1933 **625 .22**

rgan für die Fortschritte des Eisenbahnwesens,
Heft 23, 1. Dezember, S. 441.

BESSER (F.). — Umgrenzung des lichten Raumes
nd Begrenzung der **Fahrzeuge.** (4 800 Wörter & Abb.)

1933 **625 .143.2**

rgan für die Fortschritte des Eisenbahnwesens,
Heft 23, 1. Dezember, S. 450.

BERCHTENBREITER. — **Schienenstahl,** sein Ver-
hleisswiderstand und seine **Bruchsicherheit.** (2 500
örter.)

1933 **625 .14 (01**

rgan für die Fortschritte des Eisenbahnwesens,
Heft 23, 1. Dezember, S. 452.

DERIKARTZ. — Über **Schienensenkungen** unter dem
llenden Rade. (3 300 Wörter & Abb.)

1933 **621 .33**

rgan für die Fortschritte des Eisenbahnwesens,
Heft 24, 15. Dezember, S. 463.

LUITHLEN (H.). — Der **elektrische Bahnbetrieb** auf
m Internationalen Elektrizitäts-Kongress in Paris
932. (5 800 Wörter & 4 Tafeln.)

1933 **625 .216**

rgan für die Fortschritte des Eisenbahnwesens,
Heft 24, 15. Dezember, S. 469.

WITTE (Fr.) & STAMM (O.). — Neuartige **selbst-**
ätige Zughaken-Kupplungen. (2 100 Wörter & Abb.).

1933 **621 .131.1 (.47)**

rgan für die Fortschritte des Eisenbahnwesens,
Heft 24, 15. Dezember, S. 473.

LUBIMOFF (W.). — **Berechnung der Zuggewichte**
n Sowjet-Russland. (1 000 Wörter.)

1933 **625 .141 (.43)**

rgan für die Fortschritte des Eisenbahnwesens,
Heft 24, 15. Dezember, S. 474.)

STÜBEL. — **Die Zuverlässigkeit der Schotterprüfun-**
en bei der Reichsbahn. (1 200 Wörter & 2 Tafeln.)

Zeitschrift des Vereines Deutscher Ingenieure. (Berlin.)

1933 **621 .43**

Zeitsch. des Ver. deutsch. Ing., Nr. 48, 2 Dezember, S. 1287.

LANGEN (A.). — Die **Diesellokomotive** mit unmittelbaren Antrieb. (1 200 Wörter & Abb.)

1933 **625 .13 (.493)**

Zeitsch. des Ver. deutsch. Ing., Nr. 50, 16. Dezember, S. 1331.

PROETEL (H.). — Die **Tunnels** unter der Schelde in Antwerpen. (3 600 Wörter & Abb.)

1933 **62. (01**

Zeitsch. des Ver. deutsch. Ing., Nr. 50, 16. Dezember, S. 1335.

THUM (A.). — Steigerung der **Dauerhaltbarkeit** durch Oberflächendrücken. (2 900 Wörter & Abb.)

Zeitschrift für das gesamte Eisenbahn-Sicherungswesen. (Berlin.)

1933 **656 .257**

Zeitsch. für das gesamte Eisenb.-Sicherungsw., Nr. 15, 20. November, S. 174.

FEHLAUER (P.). — Normen und Passungen im **Stellwerkbau.** (1 900 Wörter & Abb.)

1933 **656 .256.3 (.436)**

Zeitsch. für das gesamte Eisenb.-Sicherungsw., Nr. 16, 10. Dezember, S. 181.

BIESOK (W.). — Eine neue **selbsttätige Signalanlage.** (2 900 Wörter & Abb.)

Zeitung des Vereins Mitteleuropäischer Eisenbahnverwaltungen. (Berlin.)

1933 **656 .212.7**

Zeitung des Vereins Mitteleurop. Eisenbahnverw., Nr. 47, 23. November. S. 949.

BASELER. — Die Lage der Rampen im zukünftigen **Behälterverkehr.** (3 700 Wörter.)

1933 **656 .234 (.43)**

Zeitung des Vereins Mitteleurop. Eisenbahnverw., Nr. 48, 30. November, S. 969.

FRITZE. — Neue Wege im **Personentarif** der Reichsbahn & (3 900 Wörter.)

1933 **656 .222 (.43)**

Zeitung des Vereins Mitteleurop. Eisenbahnverw., Nr. 48, 30. November, S. 973.

DERIKARTZ. — Die neuen **Fahrdienstvorschriften.** (4 000 Wörter.)

1933 **656 (.43)**

Zeitung des Vereins Mitteleurop. Eisenbahnverw., Nr. 49, 7. Dezember, S. 989.

THAYSSEN. — Deutscher **Flugeisenbahn-Expressgutverkehr.** (4 200 Wörter.)

1933 **656 .1 (.73)**

Zeitung des Vereins Mitteleurop. Eisenbahnverw., Nr. 50, 14. Dezember, S. 1010.

JOSEPH (K.). — Die Bereitstellung des Grund und Bodens für die erste **Kraftfahrbahn** Frankfurt-Heidelberg-Mannheim. (4 200 Wörter.)

In English.

Bulletin, American Railway Engineering Association. (Chicago, Ill.)

1933 **625 .14 (01 (.73)**

Bull., Amer. Ry. Eng. Asson, August, p. 65.

Special Committee on stresses in railroad track. Sixth Progress Report 1933: I. Introduction. — II. Laboratory tests of rail-joints. — III. Tests of rail-joints on the Pennsylvania Railroad. — IV. Tests of rail-joints on the Chesapeake and Ohio Railway. — V. Track depression and rail stresses in tests on the Chesapeake and Ohio Railway. — VI. Tests of G.E.O. track on the Missouri Pacific Railroad. — VII. Discussion of tests of rail-joints. — VIII. Discussion of tests of track. (110 000 words, tables & fig.)

Engineer. (London.)

1933 **621 .31 (.485)**

Engineer, No. 4061, November 10, p. 449; No. 4062, November 17, p. 482; No. 4063, November 24, p. 510. No. 4064, December 1, p. 538.

Recent **hydro-electric power plants** in Sweden. (12 500 words & fig.)

1933 **656. (064 (.42)**

Engineer, No. 4061, November 1 , p. 451; No. 4062, November 17, p. 500; No. 4063, November 24, p. 518.

The Public Works, Roads and Transport Exhibition, Royal Agricultural Hall, Islington. (14 200 words & fig.)

1933 **621 .133.4 (.42)**

Engineer, No. 4061, November 10, p. 468.

Improved **water pick-up gear,** L. M. S. Ry. (500 words & fig.)

1933 **621 .43 (064 (.42)**

Engineer, No. 4061, November 10, p. 470; No. 4062, November 17, p. 484.

Commercial **Motor Transport Exhibition.** (11 900 words & fig.)

1933 **621 .13 (0**

Engineer, No. 4062, November 17, p. 489.

Modern **trends in railway motive power.** (2 600 words & fig.)

1933 **621 .335 (.42) & 621 .42 (.42)**

Engineer, No. 4062, November 17, p. 490.

L. N. E. R. **main line oil-electric locomotive.** (1 300 words & fig.)

1933 **621 .18 (.494)**

Engineer, No. 4062, November 17, p. 496; No. 4064, November 24, p. 525.

STODOLA (A.). — The **Sulzer single-tube steam generator.** (6 500 words & fig.)

1933 **621 .**

Engineer, No. 4063, November 24, p. 512; No. 40 December 1, p. 540.

Alternating current voltage systems. (5 800 wo & fig.)

1933 **536 & 621 .**

Engineer, No. 4063, November 24, p. 524; No. 40 December 1, p. 552.

Heat liberation and transmission in boilers. Pa read at the Institution of Mechanical Engineers. (6 7 words & fig.)

1933 **621 .335 (.81) & 621 .43 (.8**

Engineer, No. 4063, November 24, p. 529.

Oil-electric train set for Brazil. (850 words & fig.)

1933 **669**

Engineer, No. 4064, December 1, p. 542.

Research on steels for high temperatures. (3 9 words.)

1933 **669**

Engineers, No. 4064, December 1, p. 549.

Steel research. (1 700 words.)

1933 **669**

Engineers, No. 4064, December 1, p. 554.

Steels for use at high temperatures. (1 500 wor & fig.)

Engineering. (London.)

1933 **621 .31 (.4**

Engineering, No. 3539, November 10, p. 509; No. 35 December 1, p. 593.

RICH (Th.). — **Hydro-electric developments** at Truyère, France. (7 400 words & fig.)

1933 **62. (**

Engineering, No. 3539, November 10, p. 512.

The National Physical Laboratory. Physics Depar ment. — **X-ray analysis, structural effects of col working.** (1 800 words & fig.)

1933 **621 .43 (064 (.4**

Engineering, No. 3539, November 10, p. 513; No. 35 November 24, p. 582.

The **Commercial Vehicle Exhibition** at Olympia. (9 8 words & fig.)

1933 **625 .13 (.42) & 625 .4 (.4**

Engineering, No. 3540, November 17, p. 535.

Escalator tunnel construction at Knightsbridge tu station. (4 500 words & fig.)

1933 **656. (064 (.4**

Engineering, No. 3540, November 17, p. 539; No. 35 November 24, p. 565; No. 3542, December 1, p. 60

The Public Works, Roads and Transport Exhibitio Royal Agricultural Hall, Islington. (15 200 words & fig

1933 **621 .335 (.42) & 621 .43 (.4**

Engineering, No. 3541, November 24, p. 571.

Main-line oil-electric locomotive. (1 200 words & fig

1933 **536 & 621 .18**
ngineering, No. 3541, November 24, p. 586; No. 3542, December 1, p. 611.
ROBEY (E. W.) & HARLOW (W. F.). — **Heat peration and transmission in large steam-generating ants.** (5 500 words & fig.)

1933 **656 .211.5 (.42) & 725 .31 (.42)**
ngineering, No. 3542, December 1, p. 593.
Reconstruction work at Paddington Station. (1 200 ords & fig.)

1933 **621 .133.1**
ngineering, No. 3542, December 1, p. 604.
Fuel research. (1 900 words.)

Engineering News-Record. (New York.)

1933 **656 .211 (.73) & 725 .31 (.73)**
ngineering News-Record, No. 18, November 2, p. 524.
Cincinnati's new Union Railway Terminal. (900 words fig.)

1933 **624 (.73)**
ngineering News-Record, No. 18, November 2, p. 526.
McGAVREN (D. A.). — **Concrete rigid-frame bridges r railroad loadings.** (2 400 words & fig.)

1933 **693**
ngineering News-Record. No. 19, November 9, p. 558.
STEWART (E. P.). — **New test data aid quality ntrol of gunite.** (4 900 words & fig.)

1933 **692 (.44) & 693 (.44)**
ngineering News-Record, No. 19, November 9, p. 562.
New cement specifications proposed in France (1 000 ords.)

1933 **625 .1 (.73)**
ngineering News-Record, No. 19, November 9, p. 563.
Santa Fe elevates its tracks in Oklahoma City. (2 200 ords & fig.)

1933 **625 .13 (.42)**
ngineering News-Record, No. 20, November 16, p. 581.
TRATMAN (E. E. R.). — **Mersey River vehicle nnel** in England nears completion. (1 700 words fig.)

1933 **62 (01 & 669 .1**
ngineering News-Record, No. 20, November 16, p. 593.
UNGER (J. S.). — **Steel in sea water examined ter 31 years' exposure.** (700 words & fig.)

1933 **624 (0 & 669**
ngineering News-Record, No. 21, November 23, p. 611.
REPPERT (Ch. M.). — **Aluminum enters bridge nstruction.** (3 300 words & fig.)

Great Western Railway Magazine. (Reading.)

1933 **621 .43 (.42)**
reat Western Ry. Mag., December, p. 502.
LOCK (C. S.). — **Experimental stream-lined heavy- rail car.** (1 500 words & fig.)

1933 **656 .211 (.42), 656 .253 (.42) & 725 .31 (.42)**
Great Western Ry. Mag., December, p. 509.
WOODBRIDGE (A. W.). — **The alterations at Paddington Station. — Part III. The new signalling arrangements.** (2 100 words & fig.)

1933 **529 (.42) & 656 .211 (.42)**
Great Western Ry. Mag., December, p. 518.
The electrification of clocks at Paddington Station. (900 words & fig.)

1933 **656 .261 (.42)**
Great Western Ry. Mag., December, p. 524.
Co-ordination of rail and road services. — The Four Group Railways assume control of Carter Paterson & Co., Ltd., and Pickfords, Ltd. (2 400 words & fig.)

Indian Railway Gazette. (Bombay.)

1933 **385 .1 (.54)**
Indian Railway Gazette, October, p. 205.
RUSSELL (Sir Guthrie). — **India's railway system.** A state investment of Rs. 800 crores. (3 700 words.)

1933 **621 .43 (.43)**
Indian Railway Gazette, October, p. 209.
STRAUSS (F.). — **Development of railcars in Germany. High speed obtained.**

Journal, Permanent Way Institution. (London.)

1933 **625 .12**
Journal, Permanent Way Institution, August, p. 165.
SEATON (T. H.). — **Clay and its effect on railway construction and maintenance.** (4 000 words & fig.)

1933 **624 & 625 .13**
Journal, Permanent Way Institution, August, p. 173.
BUTLAND (A. N.). — **Notes on divisional bridge-work.** (5 800 words.)

1933 **621 .392 & 625 .15**
Journal, Permanent Way Institution, August, p. 185.
SHELDON (A. W.). — **Reconditioning of worn railway crossings by the arc welding process.** (4 600 words & fig.)

1933 **625 .162**
Journal, Permanent Way Institution, August, p. 195.
MAYCOCK (M. G.). — **Level crossings.** (4 500 words & fig.)

London & North Eastern Railway Magazine. (London.)

1933 **621 .133.7 (.42) & 725 .33 (.42)**
London & North Eastern Ry. Mag., December, p. 648.
GREEN (F.). — **Water softening** on the L. N. E. R. (1 300 words & fig.)

Modern Transport. (London.)

1933 **656 .261**
Modern Transport, No. 764, November 4, p. 5.
HAMMETT (A. E.). — **Railway cartage and terminal work.** (4 400 words & fig.)

1933 **347 .763 (.41) & 656 .1 (.41)**
Modern Transport, No. 764, November 4, p. 9.
DULANTY (J. W.). — **Road transport in the Irish Free State.** (1 500 words & fig.)

1933 **385 (.42)**
Modern Transport, No. 764, November 4, p. 14.
WOOD (W. V.). — **British railways since the war.** (5 700 words.)

1933 **385 .6 (.4)**
Modern Transport, No. 764, November 4, p. 16.
STRAUSS (F.). — **Railways of Central Europe. Proposals for a tariff block.** (1 000 words.)

1933 **385 .113 (.54)**
Modern Transport, No. 764, November 4, p. 17.
Railways in India. — Operating results in 1932-33. (1 500 words.)

1933 **621 .133.7 (.42)**
Modern Transport, No. 764, November 4, p. 20.
Water pick-up gear. — L. M. S. experiments. (800 words & fig.)

1933 **347 .763 (.42) & 656 .1 (.42)**
Modern Transport, No. 765, November 11, p. 3.
Legislation and motor-transport. Minister on the Road-Rail Bill. (1 500 words & fig.)

1933 **656 .1 (.42)**
Modern Transport, No. 765, November 11, p. 5.
MAYBURY (Sir Henry P.). — **Highways in Great Britain. Reviews of post-war development.** (1 900 words & fig.)

1933 **385 .3 (.54)**
Modern Transport, No. 765, November 11, p. 6.
New railway authority for India. (2 200 words.)

1933 **621 .43 (.43)**
Modern Transport, No. 765, November 11, p. 7.
Locomotive development in Germany. Oil and petrol engined light units for goods services. (1 600 words & fig.)

1933 **656 .1 (.42)**
Modern Transport, No. 765, November 11, p. 11.
NICHOLL (J. S.). — **Future of road haulage industry.** (7 800 words.)

1933 **621 .43 & 656 .1**
Modern Transport, No. 765, November 11, p. 15.
SHEARMAN (J.). — **Design of commercial motor vehicles. Meeting railway requirements.** (3 300 words.)

1933 **347 .763 (.4**
Modern Transport, No. 765, November 11, p. 19.
BRISTOW (F. G.). — **Legislation and the transp industry.** (2 000 words.)

1933 **621 .43 (064 (.4**
Modern Transport, No. 765, November 11, p. 23.
TWELVETREES (R.). — Technical aspect of t **Motor Transport Exhibition.** (6 200 words & fig.)

1933 **621 .335 (.42) & 621 .43 (.4**
Modern Transport, No. 766, November 18, p. 3.
Oil-electric locomotive for British main line railwa (1 700 words & fig.)

1933 **621 .33 (.49**
Modern Transport, No. 766, November 18, p. 4.
Railway electrification in Belgium. Brussels-Antw line. (1 300 words.)

1933 **347 .763 (.4**
Modern Transport, No. 766, November 18, p. 5.
Road and Rail Traffic Bill. (2 400 words.)

1933 **621 .335 (.81) & 625 .43 (.8**
Modern Transport, No. 767, November 25, p. 3.
British-built **oil-electric train for Brazil.** (1 100 wo & fig.)

1933 **347 .763 (.4**
Modern Transport, No. 767, November 25, p. 5.
Road-Rail Traffic Act. — No. 1. — Licensing of goo vehicles. (2 300 words.)

1933 **656 .1 & 656**
Modern Transport, No. 768, December 2, p. 3.
Co-ordination of **rail and road transport. Monopo and regulated competition.** (2 400 words.)

1933 **656 .213 (.6**
Modern Transport, No. 768, December 2, p. 5.
Transport developments in Sierra Leone. (3 200 wo & fig.)

1933 **625 .2**
Modern Transport, No. 768, December 2, p. 9.
Roller bearings in rail transport. (2 900 words.)

1933 **347 .763 (.4**
Modern Transport, No. 768, December 2, p. 12.
Road and Rail Traffic Act. — No. 2. — Powers a duties of the area traffic commissioners. (2 500 word

---

Railway Age. (New York.)

1933 **313 : 621 .138 (.73, 313 : 625 .17 (.7 & 313 : 625 .26 (.7**
Railway Age, No. 18, October 28, p. 587.
Maintenance expenses down three billions since 19 (2 400 words & 3 tables.)

1933 656 (.73)
ilway Age, No. 18, October 28, p. 590.
Old ways are not goot enough. **Traffic and transtation requirements** are changing. New high standrds of **speed and efficiency** are compelled by comition. (2 500 words & fig.)

1933 313 : 621 .13 (.73)
ilway Age, No. 18, October 28, p. 593.
Motive power obsolescence high. (2 700 words & fig.)

1933 313 : 625 .26 (.73)
ilway Age, No. 18, October 28, p. 597.
Deferred **freight-car maintenance** exceeds $ 300 000 000. 100 words, 6 tables & fig.)

1933 313 : 625 .26 (.73)
ilway Age, No. 18. October 28, p. 601.
Passenger equipment maintenance drastically cut. 800 words, tables & fig.)

1933 621 .138 (.73)
ilway Age, No. 18. October 28, p. 604.
Can equipment maintenance costs be reduced ? (3 600 rds, 1 table & fig.)

1933 313 : 625 .17 (.73)
ilway Age, No. 18. October 28, p. 608.
Railroads far behind in maintenance of **tracks and uctures.** (7 800 words & fig.)

1933 656 .212
ilway Age, No. 18. October 28, p. 616.
Attacking **the terminal problem.** (2 500 words & fig.)

1933 656 .1 (.73) & 656 .261 (.73)
ilway Age. No. 18. October 28. p. 619.
A place for **trucks and buses.** (3 100 words & fig.)

1933 656 .25 (.73)
ilway Age, No. 18, October 28, p. 622.
Signaling work to be done. **Maintenance work** to be ne. (2 400 words & fig.)

1933 621 .33 (.73) & 621 .39 (.73)
ilway Age. No. 18, October 28, p. 625.
Electrical requirements of steam railroads. (3 400 rds & fig.)

1933 313 : 621 .139 (.73), 313 : 625 .18 (.73) & 313 : 625 .27 (.73)
ilway Age, No. 18, October 28, p. 629.
Railway purchases are trumps. (3 800 words, tables fig.)

1933 656 .261 (.73)
ilway Age, No. 19. November 4, p. 651.
Is there a demand for **storedoor service ?** — Traffic velopment series. Article No. 11. (3 000 words & fig.)

1933 621 .39 (.73), 625 .143.3 (.73) & 625 .245 (.73)
ilway Age, No. 19, November 4, p. 655.
Rail flaw detector greatly improved in five years. 900 words & fig.)

1933 347 .763 (.73) & 656 .1 (.73)
Railway Age, No. 19, November 4, p. 659.
Commissioners draft **bill for control of interstate motor transport.** (3 400 words.)

1933 621 .335 (.73) & 621 .43 (.73)
Railway Age, No. 19, November 4, p. 663.
Diesel-electric switching power for the Burlington. (1 600 words & fig.)

1933 614 .8 (06 (.73)
Railway Age, No. 19, November 4, p. 665.
Annual **meeting of Safety Section, American Railway Association,** held at Chicago, October 3-5, 1933. (5 600 words & fig.)

1933 656 .261 (.73)
Railway Age, No. 20, November 11, p. 685.
What results from **storedoor service ?** Traffic development series. Article No. 12. (3 300 words & fig.)

1933 625 .1 (.73)
Railway Age, No. 20, November 11, p. 688.
Large **grade separation project** completed on the Reading. (3 600 words & fig.)

1933 621 .335 (.73), 621 .338 (.73) & 621 .43 (.73)
Railway Age, No. 20, November 11, p. 692.
Stainless-steel train delivered to Texas & Pacific. (1 800 words & fig.)

1933 385 .1 (.73)
Railway Age, No. 20, November 11, p. 695.
Government offers loans for rails and equipment. (3 800 words.)

1933 656 .2 (06 (.73)
Railway Age, No. 20, November 11, p. 699.
Railway Business Association holds annual meeting, Chicago 9, 1933. (6 000 words.)

1933 621 .133.2 (.73)
Railway Age, No. 21, November 18, p. 719.
Union Pacific makes service **tests of firebar grates.** (2 200 words & fig.)

1933 625 .154 (.73)
Railway Age, No. 21. November 18, p. 722.
What about the **turntable ?** (2 900 words & fig.)

1933 621 .139 (.73), 625 .18 (.73) & 625 .27 (.73)
Railway Age, No. 21, November 18, p. 729.
LOCKWOOD (R. L.). — **Railway purchases and standards.** (2 500 words.)

1933 656 .257 (.73)
Railway Age, No. 21, November 18, p. 731.
Remote control on the Missouri Pacific. (800 words & fig.)

1933 **385 .3 (.73)**
Railway Age, No. 21, November 18, p. 733.
TURNEY (J. R.). — **Whither co-ordination ?** — Some requisites for the formulation of a **national transportation policy.** (3 900 words.)

1933 **625 .245, 656 .261 & 686 .225**
Railway Age, No. 22, November 25, p. 751.
What is the place of **the freight container ?** — Traffic development series. — Article No. 13. (2 800 words & fig.)

1933 **625 .23 (0 & 625 .24 (0**
Railway Age, No. 22, November 25, p. 754.
CURLEY (F. C.). — **Light-weight railroad equipment.** (3 900 words & fig.)

1933 **347 .763 (.73) & 385 .3 (.73)**
Railway Age, No. 22, November 25, p. 761.
Railways answer Eastman's questions on legislation. (4 900 words.)

1933 **656 .261 (.73)**
Railway Age, No. 22, November 25, p. 765.
Storedoor service near on Eastern Lines. (5 000 words.)

1933 **656 (.42)**
Railway Age, No. 22, November 25, p. 768.
SHERRINGTON (C. E. R.). — **Co-ordination in Great Britain.**

Railway Engineering and Maintenance. (Chicago.)

1933 **697**
Railway Engineering and Maintenance, October, p. 466.
Solving **the heating problem for small buildings.** — American Railway Engineering Association Committee discusses the progress that has been made in recent years and compares the various systems now being used. (2 700 words & fig.)

1933 **625 .154**
Railway Engineering and Maintenance, October, p. 470.
Install **steam pipes under turntable floor.** (450 words & fig.)

1933 **621 .392 & 625 .13**
Railway Engineering and Maintenance, October, p. 471.
Unusual **method of repairing an old bridge.** (1 000 words & fig.)

1933 **625 .1 (06 (.73)**
Railway Engineering and Maintenance, October, p. 473.
Roadmasters Association holds convention « in print ». (31 100 words & fig.)

1933 **625 .171**
Railway Engineering and Maintenance, October, p. 474.
Routine track inspection — its purpose, scope and value. Report of Committee (Roadmasters Association). (6 200 words & fig.)

1933 **614 .8 & 625**
Railway Engineering and Maintenance, October, p.
The protection of trackmen working under tra
especially in multiple track territory and when u
noise-making equipment. Report of Committee (R
masters Association). (6 700 words & fig.)

1933 **625 .14**
Railway Engineering and Maintenance, October, p.
Rail failures, their cause, detection, and disposit
Report of Committee (Roadmasters Association). (7
words & fig.)

1933 **625 .**
Railway Engineering and Maintenance, October, p.
Methods of **handling snow and ice on railro**
Report of Committee (Roadmasters Association). (5
words & fig.)

1913 **625 .**
Railway Engineering and Maintenance, October, p.
Water pockets — their cause and cure. Report
Committee (Roadmasters Association). (5 500 w
& fig.)

1933 **625 .143 (.73) & 625 .18 (.**
Railway Engineering and Maintenance, November, p.
A million-ton **rail order.** (5 500 words & fig.)

1933 **721**
Railway Engineering and Maintenance, November, p.
Dowels and regrouting stop wall bulging. (1 500 wo
& fig.)

1933 **621 .133.7 (.73), 621 .6 (.**
& 725 .33 (.
Railway Engineering and Maintenance, November, p.
What kind of a **deep-well pump ?** (1 600 words & f

1933 **625 .143.4 (.73) & 625 .172 (.**
Railway Engineering and Maintenance, November, p.
GADD (W. E.). — **Rail joints and their maintena**
(1 800 words & fig.)

1933
Railway Engineering and Maintenance, November, p.
Raise freight house roof with track jacks. (1
words & fig.)

1933 **625 .141 (.73) & 625 .173 (.**
Railway Engineering and Maintenance, November, p.
Fairmont **ballast cleaner** used on Pennsylvania. (
words & fig.)

Railway Gazette. (London.)

1933 **621 .13**
Railway Gazette, No. 18, November, p. 694.
Proposed **design for high-pressure condensing lo**
motive. (500 words & fig.)

1933 **385. (093 (.9**
Railway Gazette, No. 18, November, p. 695.
Railway development in Wellington, New Zeala
(1 700 words & fig.)

1933 **656 .253 (.42)**
ilway Gazette, No. 18, November, p. 700.
Solution of a signalling problem. (1 400 words.)

1933 **621 .138 (.489)**
ilway Gazette, No. 20, November 17, p.
Some special features of Aarhus new **locomotive shed,** enmark. (1 000 works & fig.)

1933 **625 .29**
ilway Gazette, No. 20, November 17, p. 729.
An **axlebox packing and oil cleaning and recovery** ant. (700 words & fig.)

1933 **625 .232 (.42)**
ilway Gazette, No. 20, November 17, p. 731.
All-electric kitchen cars. (1 300 words & fig.)

1933 **656 .253 (.43)**
ilway Gazette, No. 20, November 17, p. 733.
The Reichsbahn's new **distant signal.** (1 500 words fig.)

1933 **656 .1 (.43) & 656 .261 (.43)**
ilway Gazette, No. 21, November 24, p. 783.
Door-to-door transport in Germany. (750 words fig.)

1933 **656 .261 (.42)**
ilway Gazette, No. 21, November 24, p. 785.
Testing the **Scammell mechanical horse.** (600 words.)

1933 **625 .242 (.42)**
ilway Gazette, No. 21, November 24, p. 787.
The G. W. R. 5 000 **20-ton wagon** scheme. (500 words fig.)

1933 **621 .135.2 (.73)**
ilway Gazette, No. 21, November 24, p. 788.
Roller bearing locomotive. (400 words & fig.)

1933 **621 .135.2**
ilway Gazette, No. 21, November 24, p. 793.
Roller bearings for rolling stock. (850 words & fig.)

1933 **656 .253 (.42)**
ilway Gazette, No. 22, December 1, p. 815.
Paddington **power signalling.** (1 800 words & fig.)

1933 **621 .138.1 (.91)**
ilway Gazette, No. 22, December 1, p. 820.
New **locomotive running shed** at Kuala Lumpur. 100 words & fig.)

1933 **621 .335 (.54) & 621 .338 (.54)**
ctric Ry. Traction, p. 756, supplt. to the Ry. Gazette, November 17.
Articulated electric trains for India. (2 400 words fig.)

1933 **621 .332**
ctric Ry. Traction, p. 760, supplt. to the Ry. Gazette, November 17.
Cross-tie and track sectionalising. (1 700 words & fig.)

1933 **621 .335 (.43)**
Electric Ry. Traction, p. 762, supplt. to the Ry. Gazette, November 17.
German **high-speed electric locomotive.** (800 words & fig.)

1933 **621 .33 (.44)**
Electric Ry. Traction, p. 764, supplt. to the Ry. Gazette, November 17.
Orleans railway electrification. (1 800 words & fig.)

1933 **621 .33 (.73)**
Electric Ry. Traction, p. 767, supplt. to the Ry. Gazette, November 17.
Pennsylvania electrification. (800 words & fig.)

1933 **313 : 621 .33**
Electric Ry. Traction, p. 768, supplt. to the Ry. Gazette, November 17.
Electrification of steam railways. (Tables.)

1933 **621 .43 (.41)**
Diesel Ry. Traction, p. 836, supplt. to the Ry. Gazette, December 1.
Diesel traction in Ireland. (1 500 words & fig.)

1933 **621 .43 (.82)**
Diesel Ry. Traction, p. 839, supplt. to the Ry. Gazette, December 1.
SACCAGGIO (P. C.). — Experiences with **Diesel-electric traction.** (2 300 words & fig.)

1933 **621 .335 (.71) & 621 .43 (.71)**
Diesel Ry. Traction, p. 841, supplt. to the Ry. Gazette, December 1.
New Canadian National **shunter.** (900 words & fig.)

1933 **621 .335 (.81) & 621 .43 (.81)**
Diesel Ry. Traction, p. 842, supplt. to the Ry. Gazette, December 1.
Articulated train for Brazil. (1 000 words & fig.)

1933
Diesel Ry. Traction, p. 844, supplt. to the Ry. Gazette, December 1.
The starting problem in Diesel rail vehicles (relative merits of air and electricity). (1 500 words & fig.)

1933 **621 .43 (.52)**
Diesel Ry. Traction, p. 847, supplt. to the Ry. Gazette, December 1.
Japanese **Diesel-mechanical locomotive.** (1 300 words & fig.)

Railway Magazine. (London.)

1933 **656 .222.1 (.42)**
Railway Magazine, December, p. 401.
British locomotive practice and performance. (4 700 words, tables & fig.)

1933 **621 .132.8 (.65)**
Railway Magazine, December, p. 413.
The first **high-speed articulated locomotive.** Eighty miles an hour on an African railway. (1 800 words & fig.)

1933 **656 .211 (.42) & 725 .31 (.42)**
Railway Magazine, December, p. 419.
Paddington modernised, Great Western Railway. (2 400 words & fig.)

Railway Signaling. (Chicago.)

1933 **656 .257 (.73)**
Railway Signaling, October, p. 267.
OPPELT (J. H.). — **An interlocking six miles long.** (2 700 words & fig.)

1933 **656 .259**
Railway Signaling, October, p. 271.
Railway **crossing gates power operated** on Duluth, South Shore & Atlantic. (1 000 words & fig.)

1933 **656 .258 (.73)**
Railway Signaling, October, p. 273.
Interlocking for Bath bridge on the Maine Central. (1 800 words & fig.)

1933 **625 .151 (.73) & 656 .257 (.73)**
Railway Signaling, October, p. 275.
Spring switch on the Wabash. (1 400 words & fig.)

1933 **656 .257 (.73)**
Railway Signaling, October, p. 277.
Modernizing an **electric interlocking.** (1 500 words & fig.)

1933 **621 .31 (.73) & 656 .25 (.73)**
Railway Signaling, October, p. 279.
Milwaukee uses **capacitors on signal power transmission lines.** (1 200 words & fig.)

1933 **656 .258 (.73)**
Railway Signaling, November, p. 291.
Interlocking for Missouri-Kansas-Texas bridge. (1 400 words & fig.)

1933 **656 .257**
Railway Signaling, November, p. 293.
Remote control on the Missouri Pacific. (1 100 words & fig.)

1933 **656 .256.3 (.73)**
Railway Signaling, November, p. 295.
Signaling of new terminal. (1 800 words & fig.)

1933 **656 .253 (.73) & 656 .283 (.73)**
Railway Signaling, November, p. 297.
Train accident on the Erie Railroad. (1 500 words & fig.)

1933 **656 .257 (.73)**
Railway Signaling, November, p. 299.
Spring switch on the St. Louis — San Francisco. (1 300 words & fig.)

1933 **656 .257 (**
Railway Signaling, November, p. 301.
Automatic interlocking on the Alton & Soutl (1 700 words & fig.)

1933 **621 .39 (.945) & 656 .256 (.9**
Railway Signaling, November, p. 303.
MELHUISH (C. A.). — **Track-relay tester.** words & fig.)

1933 **656 .256.3 (.73) & 656 .257 (**
Railway Signaling, November, p. 304.
Automatic end-of-double-track. (1 000 words &

1933 **656 .25**
Railway Signaling, November, p. 306.
Centralized traffic control and remote control. words.)

1933 **656**
Railway Signaling, November, p. 306.
Call-on signals. (2 000 words.)

Proceedings, American Society of Civil Engine (New York.)

1933 **624**
Proceed., Amer. Soc. Civil Eng., October, p. 1247.
WHITNEY (Ch. S.). — Analysis of **unsymmetr concrete arches.** (5 400 words & fig.)

1933 **62. (01 & 72**
Proceed., Amer. Soc. Civil Eng., October, p. 1269.
SERGEV (S. I.). — **Deformation of steel reinfo ment during and after construction.** (7 600 w & fig.)

1933
Proceed., Amer. Soc. Civil Eng., November, p. 1377.
PARSONS (H. de B.). — Some **soil pressure te** (4 900 words & fig.)

Proceedings, Institution of Mechanical Engine (London.)

1933 **62. (01 & 656 .28**
Proceed., Institut. of Mech. Engineers, Vol. 124, p.
SCHUSTER (L. W.). — The investigation of **mechanical breakdown of prime movers and bo** plant. (Paper and discussion). (65 000 words & fig

1933 **621 .392 & 669**
Proceed., Institut. of Mech. Engineers, Vol. 124, p.
SCHUSTER (L. W.). — A preliminary research the effect of **heat treatment of welds.** (Paper discussion.) (22 000 words, tables & fig.)

1933 **62 (01 & 669**
Proceed., Institut. of Mech. Engineers, Vol. 124, p.
COKER (E. G.), LEVI (Miss R.) & RUSSELL — **The stresses in fusion joints.** Paper and discuss (14 000 words & fig.)

1933 **62. (01 & 669 .1**

Proceed., Institut. of Mech. Engineers, Vol. 124, p. 645.

HERBERT (E. G.). — Report on the **ageing of tool steel.** (12 000 words & fig.)

1933 **62 (01**

Proceed., Institut. of Mech. Engineers, Vol. 124, p. 685.

BACON (F.). — **Fatigue and corrosion fatigue with special reference to service breakages.** (15 000 words, tables & fig.)

1933 **65**

Proceed., Institut. of Mech. Engineers, Vol. 124, p. 737.

DRESSER (C.) & COOKE (J. O.). — **Industrial standardization** in the mechanical engineering industry. (2 900 words & tables.)

Proceedings, Institution of Railway Signal Engineers. (Reading).

1933 **656 .25 (06 (.42)**

Proc., Institut. of Ry. Signal Engineers, Part I, p. 13.

Annual General Meeting of the Institution, 9th February, 1933. — Presidential address: **Brief history of progress in signalling since 1923.** (4 500 words.)

1933 **656 .257**

Proc., Institut. of Ry. Signal Engineers, Part I, p. 28.

Discussion on the **running of electric wires and cables** and the class of cable and wire used. (7 200 words.)

1933 **656 .254**

Proc., Institut. of Ry. Signal Engineers, Part I, p. 53.

CROOK (C. H.). — **Automatic train control.** (20 000 words.)

1933 **656 .254**

Proc., Institut. of Ry. Signal Engineers, Part I, p. 116.

EDWARDS (J. R.). — **Railway telephony.** (10 000 words).

Transit Journal. (New York.)

1933 **625 .26 (.73)**

Transit Journal, November, p. 397.

CHURCH (L.). — Cleveland wins 1933 **maintenance** award. Radical changes in painting methods, unification of motor coach and street car repair facilities, and revision of shop overhaul methods and mechanical operations following time studies, have substantially lowered maintenance costs. (4 000 words & fig.)

University of Illinois Bulletin (Urbana, Ill.)

1933 **656 .251**

University of Illinois Bulletin, June, 6, p. 7.

SCHMIDT (E. C.) & SCHRADER (H. J.). — **The friction of railway brake shoes, its variation with speed, shoe pressure, and wheel material.** (25 000 words & fig.)

In Spanish.

Anales de la Asociación de Antiguos Alumnos del I. C. A. I. (Madrid.)

1933 **621 .33**

Anales de la Asociación de Antiguos Alumnos del I. C. A. I., noviembre, p. 571.

La **rentabilidad de las electrificaciones ferroviarias.** (1 600 palabras.)

Ferrocarriles y Tranvias. (Madrid.)

1933 **621 .13 (.44) & 625 .2 (.44)**

Ferrocarriles y Tranvias, diciembre, p. 418.

MENDOZA VILAR (A.). — La **unificación del material** en los ferrocarriles franceses. (5 300 palabras & fig.)

Ingenieria y Construcción. (Madrid.)

1933 **691**

Ingenieria y Construcción, diciembre, p. 639.

SERRANO (C.). — **Construcciones metálicas resistentes a la corrosión.** (4 200 palabras.)

1933 **625 .2**

Ingenieria y Construcción, diciembre, p. 642.

DUMAS (A.). — Construcción de **material móvil ferroviario** a base de aleaciones ligeras. (4 200 palabras & fig.)

Revista de Obras Públicas. (Madrid.)

1933 **624 .63 (.460)**

Revista de Obras Públicas, nº 22, 15 de noviembre, p. 477.

VILLALBA GRANDA (C.). — El **puente Vierendeel**, de la Riera de Caldas. (2 900 palabras & fig.)

1933 **385 .14 (.460)**

Revista de Obras Públicas, nº 22, 15 de noviembre, p. 482.

BARCELO (J.). — Los ferrocarriles y el « **intervencionismo** » del Estado. (3 200 palabras.)

1933 **625 .5**

Revista de Obras Públicas, nº 22, 15 de noviembre, p. 485; nº 23, 1º de diciembre, p. 505.

OCHOA y BENJUMEA (J.). — **Funiculares aéreos** para el transporte de personas. (4 600 palabras & fig.)

1933 **691**

Revista de Obras Públicas, nº 23, 1º de diciembre, p. 501.

PARGA-PONDAL (I.). — Sobre un método para el estudio de la **corrosión de los hormigones** por los líquidos agresivos. (3 900 palabras & fig.)

1933 **691**

Revista de Obras Públicas, 15 de diciembre, p. 525.

PARGA-PONDAL (I.) & BAENTSCH (S.). — Sobre un método para el estudio de la **corrosión de los hormigones** por los liquidos agresivos. (4 300 palabras & 16 tablas.)

In Italian.

Annali dei lavori pubblici. (Roma.)

1933 **624. (0**

Annali dei lavori pubblici, agosto, p. 665.

Carichi da considerare nel calcolo dei **ponti** per strade ordinarie. (1 600 parole & quadri.)

La tecnica professionale. (Firenze.)

1933 **621 .135. (01 & 625 .14 (01**

La tecnica professionale, dicembre, p. 347.

Sui moti di serpeggiamento dei rotabili in marcia e sulla loro importanza nei riguardi della buona **conservazione del binario.** (3 600 parole & fig.)

L'Ingegnere. (Roma.)

1933 **625 .113**

L'Ingegnere, dicembre, p. 927.

CORINI (F.). — Il **raccordo razionale** fra successive livellette. (3 500 parole & fig.)

Rivista tecnica delle ferrovie italiane. (Roma.)

1933 **385 .587 (.45) & 621 .138.5 (.45)**

Rivista tecnica delle ferrovie italiane, 15 novembre, p. 249.

FANELLI (M.). — Il sistema di **lavorazione a premio** e l'**organizzazione del lavoro** nelle officine ai depositi locomotive delle Ferrovie dello Stato. (9 800 parole & fig.)

In Dutch.

De Ingenieur. (Den Haag.)

1933 **656**

De Ingenieur, Nr 47, 24 November, p. T. 97.

DE VRIES (F.). — Beginselen van **verkeerseconomie.** (11 200 woorden.)

1933 **62. (01 & 6**

De Ingenieur, Nr 48, 1 December, p. Bt. 43.

RENGERS (N. J.). — Proefnemingen op **kolomm van beton en gewapend beton.** (2 800 woorden, 3 taf reelen & fig.)

Spoor- en Tramwegen. (Utrecht.)

1933 **656 .2**

Spoor en Tramwegen, Nr 24, 21 November, p. 621.

Vrachtkosten, goederenprijzen en crisis. (6 000 woo den & fig.)

1933 **625 .1 (.492**

Spoor en Tramwegen, Nr 24, 21 November, p. 629.

De **nieuwe lijn** Brussel (Zuid)-Denderleeuw. (1 1(woorden & fig.)

1933 **621 .133.2 & 621 .138**

Spoor en Tramwegen, Nr 24, 21 November, p. 632.

DE LANG (W.). — **Vuurkistreparatie** door midd van koperlasschen en wijziging der hemelankerco nstructie van een locomotiefketel. (1 300 woorden & fig

1933 **621 .33 (.492) & 625 .13 (.492**

Spoor en Tramwegen, Nr 25, 5 December, p. 665.

PLOMP (A.). — **Electrificatie** Rotterdam-Dordrech (1 000 woorden & fig.)

In Portuguese.

Boletim do Instituto de Engenharia (S. Paulo) (Brasil.)

1933 **669 .1 (.73**

Boletim do Instituto de Engenharia, outubro, p. 23

BARROS DE CAMPOS (F. T. e F.). — **Materia para eixos** de carros e locomotivas. (2 800 palavra & fig.)

Revista das Estradas de ferro. (Rio de Janeiro.

1933 **65**

Revista das Estradas de ferro, nº 139, 30 de outubr p. 286.

DIAS DE SANT'ANNA (F.). — **Concorrencia coordenação** dos transportes feitos por via ferrea e d rodagem. (3 300 palavras.)

15.907. — M. Weissenbruch Co., Ltd., Printer of the King, 49, rue du Poinçon, Bruxelles.

MONTHLY BIBLIOGRAPHY OF RAILWAYS [1].

PUBLISHED UNDER THE SUPERVISION OF

P. GHILAIN,

General Secretary of the Permanent Commission of the International Railway Congress Association.

MARCH (1934)

[016. 385. (02]

I. — BOOKS.

In French.

1934 **621 .89**

ANCEAU.

Manuel de graissage.

Paris (6e), J.-B. Baillière et Fils, 19, rue Hautefeuille. 1 volume, 336 pages. (Prix : 22 francs français.)

1933 **385 .1 (.494)**

CMERY (R.), Dr. Ingénieur.

La situation financière des Chemins de fer fédéraux uisses.

Lausanne, Rouge, F. et Cie. 1 volume.

1933 **621 .89**

ALZ (E.).

Principes fondamentaux de la technique du graisage.

Paris, Ch. Béranger, 15, rue des Saints-Pères, et iége, 1, quai de la Grande-Bretagne. 1 vol. (16×25), 78 pages, 18 tableaux, 44 exemples numériques et 21 figures. (Prix: 120 francs français.)

1933 **621 .33**

HEORGHIU (I. S.).

Etude économique de l'électrification d'un réseau e chemins de fer.

Paris (8e), Revue Générale de l'Electricité, 12, place e Laborde. 1 fascicule, 11 pages et fig.

1934 **656**

Les transports, services publics.

Laval. Chambre syndicale des transports automobiles subventionnés, 6, rue de Verdun. 1 volume, 72 ages. (Prix : 3 francs français.)

1934 **621 .7 & 621 .9**

OLAND (A.).

Guide théorique et formulaire pratique d'atelier our ouvriers, contremaîtres, chefs d'ateliers.

Paris (6e), Desforges, Girardot et Cie, 27 et 29, quai es Grands Augustins. 1 volume, 147 pages, tableaux figures. (Prix: 18 francs français.)

1933 **621 .132.3**

Syndicat belge des locomotives à vapeur « Franco ».

Liége, Georges Thone. 1 volume, 43 pages, schémas et figures.

In German.

1933 **385 (.43)**

Deutscher Reichsbahn-Kalender 1934.

Leipzig, Konkordia-Verlag. 1 Band. (Preis: 3.20 R.M.)

1933 **62. (01 & 669**

FRANKENBERG (H.).

Der Einfluss von Drehschwingungsbeanspruchungen auf die Festigkeit und Dämpfungsfähigkeit von Metallen, besonders von Aluminium-Legierungen.

Berlin, N.E.M. Verlag. 1 Band, 55 Seiten, 62 Abbildungen. (Preis: 3.60 R.M.)

1929 bis 1932 **691 & 721 .9**

GEHLER (W.).

Handbuch für Eisenbetonbau. Balkenbrücken.

Berlin, Wilhelm Ernst & Sohn. 1 Band, 535 Seiten mit 795 Abbildungen. (Preis: 41 R.M.)

1934 **656 .2**

HEINRICH.

Eisenbahnbetriebslehre.

Berlin, Verkehrswissenschaftliche Lehrmittelgesellschaft m. b. H. bei der Deutschen Reichsbahn. 1 Band, 850 Seiten mit 7 Anlagen. (Preis: 11.50 R.M.)

1934 **62. (03**

HERZOG (H. O.).

Wörterbuch der modernen Maschinenwerkstatt. 1. Teil: Englisch-deutsch. 2 Teil: Deutsch-englisch.

Berlin-Friedenau, Dr. Ernst Valentin. Teil 1: 326 Seiten und 227 Abbildungen. Teil 2: 359 Seiten und 221 Abbildungen. (Preis: je Band, 4.50 R.M. Zusammen 8 R.M.)

(1) The numbers placed over the title of each book are those of the decimal classification proposed by the Railway Congress conjointly with the Office Bibliographique International, of Brussels. (See « Bibliographical Decimal Classification as applied to Railway Science », by L. Weissenbruch, in the number for November 1897, of the *Bulletin of the International Railway Congress*, p. 1509).

1930 bis 1933 **721 .9**

MÖRSCH (E.).

Der Eisenbetonbau, seine Theorie und Anwendung.

Stuttgart, Konrad Wittwer. 3 Lieferungen. 1. Lieferung : 160 Seiten mit 218 Abbildungen; 2. Lieferung : 160 Seiten mit 195 Abbildungen; 3. Lieferung : 196 Seiten mit Abbildungen. (Preis. Je Lieferung 9 R.M.)

1934 **621 .116**

MÜNZINGER (F.).

Dampfkraft. Berechnung und Bau von Wasserrohrkesseln und ihre Stellung in der Energieerzeugung.

Berlin, Julius Springer. 1 Band, 348 Seiten, 41 Zahlentafeln, 20 Kurventafeln und 566 Abbildungen. (Preis : 40 R.M.)

1934 **62. (01**

OSCHATZ (H.).

Gesetzmässigkeiten des Dauerbruches und Wege zur Steigerung der Dauerhaltbarkeit.

Berlin, V.D.I. Verlag. 1 Band, 64 Seiten, 75 Abbildungen und 9 Zahlentafeln. (Preis: 5.60 R.M.)

1934 **625 .113**

SARRAZIN (O.) und OBERBECK (H.).

Tachenbuch zum Abstecken von Kreisbogen.

Berlin, Julius Springer. 1 Band, 27 Textabbildungen. (Preis: 6 R.M.)

1933 **62. (01**

SCHMIDMER (E. L.).

Ein Beitrag zur statischen und dynamischen Härteprüfung.

München und Leipzig, Fritz und Joseph Voglrieder. 1 Band, 102 Seiten, 22 Tabellen, 18 Schaubildern und 5 Abbildungen. (Preis : 4.50 R.M.)

In English.

1934 **656 .25 (0**

AMERICAN RAILWAY ASSOCIATION (A. R. A.), SIGNAL SECTION.

American Railway Signaling Principles and Practices. — Chapter III: Principles and Economic Phase of Signaling.

One pamphlet (8×6 inches), of 78 pages, illustrated. Published by the Signal Section of the A. R. A., 30, Vesey Street, New York, N.Y. (Price : 35 Cents [25 Cents to members and railroad employees].)

1934 **656 .257 & 656 .258**

AMERICAN RAILWAY ASSOCIATION (A. R. A.), SIGNAL SECTION.

American Railway Signaling Principles and Practices. — Chapter XIX : Electric Interlocking.

One pamphlet (8 × 6 inches) of 70 + 22 pages, illustrated. Published by the Signal Section of the A.R.A., 30. Vesey Street, New York, N.Y. (Price : 35 Cents [25 Cents to members and railroad employees].)

1933 **624 .51 (.**

AMERICAN SOCIETY OF CIVIL ENGINEERS.

Transactions. Vol. 97, 1933: Eight papers on **George Washington bridge** across the Hudson Ri at New York.

New York, A. S. C. E., 33 West 39th Street. (Pri $ 7.00.)

1933 **621 .118 (.**

AMERICAN SOCIETY OF MECHANICAL ENGI EERS. — Power Boiler Code, 1933, edition.

New York, Published by the A.S.M.E., 29, W Thirty-ninth Street, (5 1/2 × 8 inches), 314 pag $ 2.50.)

1933 **656 .1 (.**

An economic survey of **motor-vehicle transportat in the United States.**

Washington, D. C. Published by Bureau of Railw Economics. (6 × 9 inches), 219 pages, tables a diagrams.

1933 **385. (061.4 & 621**

Electrical section reports of the American Railw Engineering Association. Bulletin No. 359, Septem 1933.

Chicago, Ill. Published by the Association, 59, E Van Buren Street. 139 pages.

1933 **656 .25 (**

FRASER (J. H.), B. Sc.

Lewis's Railway Signal Engineering (Mechanical).

London, Constable and Company, Ltd. (Price: 16 net.)

1933 **721 .9 & 725**

GRAY (W. S.), B. A., M. A. I. (Dublin), A. M. I C. E. I.

Reinforced concrete water towers, bunkers, si and gantries.

London, Concrete Publications, Ltd. (Price: 10 net.)

1933 **385. (091 (.**

Great Western Railway Development Works (S plement to the **RAILWAY GAZETTE,** December 1933.) Principal contents : **Paddington station i** provements. — **Cardiff station** reconstruction. Temple Meads alteration. — New **Taunton stat** and widenings. — **Power and colour-light signall** at Cardiff, Paddington and Bristol. — **Dock impro ments. — Locomotive workshops and depot at W** verhampton. — New **20-ton wagons. — Marshall yards at Banbury, Severn Tunnel Junction, Rogerst** and Swansea.

London, S.W. 1. Published by the Railway Gazet 33, Tothill Street, Westminster.

1933 **669**

GREINER (E. S.), MARSH (J. S.) & STOUG TON (B.).

The alloys of iron and silicon.

London, McGraw-Hill Publishing Co., Ltd. (Pric 30 sh. net.)

1933 625 .2 (0
ACKLIN (H. M.) & LIDDELL (G. J.).
Riding comfort analysis. Purdue University. Engineering Experiment Station. Research series No. 44.
Lafayette, Ind. Purdue University.

1933 621 .3 (02
EARES (J. W.) & NEALE (R. E.).
Electrical engineering practice. A practical treatise. ol. III.
London, Chapman and Hall, Ltd. Fourth edition. Price: 30 sh. net.)

1933 621 .392 (02
Procedure handbook of arc welding design and prace.
Cleveland, Ohio. The Lincoln Electric Co. (6 × 9 ches), 434 pages, line cuts, photographs and tables. Price: $ 1.50.)

1933 625 .2 (0
OSS (J. F. S.).
Gyroscopic stabilisation of land vehicles.
London, Edward Arnold & Company. (Price : 14 sh. et.)

1933 536
CHÜLE (W.), Prof., Dipl.-Ing.
Technical thermodynamics. Translated from the German « Technische thermodynamik », by E. W. GEYSER.
London, Sir Isaac Pitman and Sons, Ltd. (Price:) sh. net.)

1934 38 (09 (.42)
HERRINGTON (C. E. R.).
A Hundred Years of Inland Transport. (The Hundred Years Series. 1830-1933.)
London, W. C. 2. Duckworth, Editor, 3 Henrietta Street. One volume (8 1/2×5 1/2 inches) of 376 pages. Price: 15 sh. net.)

1933 656 .23 (.42)
IMS (E. A.), district traffic superintendent, Eastern Bengal Railway.
Note on the methods by which the provisions regarding rates and fares embodied in the English Railways Act of 1921 were framed, both from the points of view of the Railway Companies and of the compilers of the Act.
Calcutta. Printed for the Railway Board. Technical Paper No. 285. (Price: Annas 3 or 4d.)

1933 62. (01
SMITH (D. M.).
Metallurgical analysis by the spectograph.
London, British Non-Ferrous Metals Research Association. (Price : 10 sh. 6 d. net.)

1933 385. (08 (.68)
SOUTH AFRICAN RAILWAYS and HARBOURS.
Report of the General Manager of Railways and Harbours for the year ended 31st March, 1933.
Pretoria. The Government Printer, 218 pages, fig., tables and a map. (Price:7 sh. 6 d.)

1933 621 .39
STANSEL (N. R.).
Industrial electric heating.
New York, John Wiley and Sons, Inc.; London, Chapman and Hall, Ltd. (Price: 31 sh. net.)

1933 385. (072 (.73)
The railroads in laboratory. A brief digest of research and experimentation, conducted by railroads individually and collectively through the American Railway Association in the interest of constant improvements of their facilities and service.
Washington, D. C., Published by the A. R. A. (6×9 inches), 544 pages.

1933 313 .385 (.73)
THOMPSON (Slason).
Railway statistics of the United States of America for the year 1932.
Chicago, Ill. Bureau of Railway News and Statistics, 136 pages. (Copies on application.)

1933 621 .13, 621 .335 & 621 .43
WRIGHT (J. C.) & SMITH (F. C.).
Automotrice construction and operation.
New York, John Wiley & Sons, Inc. London, Chapman and Hall, Ltd. Second edition. (Price: 21 sh. 6 d. net.)

1933 621 .133.4 & 621 .133.5
YOUNG (Everett C.), Research Professor of Railway Mechanical Engineering.
A study of the locomotive front end, including tests of a front-end model. Bulletin No. 256 of the Engineering Experiment Station, University of Illinois, Urbana. (Vol. XXX, No. 39, May, 1933 of the University of Illinois Bulletin.) One vol. (9×6 inches) of 182 pages, with 54 figures and 25 tables. (Price, paperbound: 1 dollar.)

In Italian.

1933 313 .625.6 (.45)
Relazione e dati statistici sulle tramvie estraurbane per gli anni 1928-1929-1930.
Roma, Ministero delle comunicazioni. 1 volume, 376 pagine e tavole.

1933 721 .9
RUSSO (C.).
Costruzioni in cemento armato.
Torino, Unione Tipografico Editrice Torinese. 1 volume, 519 pagine & figure.

1933 624
SANTARELLA (L.).
Arte e tecnica nell' evoluzione dei ponti.
Milano, Hoepli. 1 volume (180 × 250), 189 pagine & 280 figure.

[016 .385. (05]

II. — PERIODICALS.

In French.

Annales des travaux publics de Belgique. (Bruxelles.)

1933 **625 .113**

Annales des travaux publics de Belgique, décembre, p. 849.

LAMOEN (J.). — Le tracé des **raccordements progressifs.** (3 000 mots, tableaux & fig.)

1933 **656 .1**

Annales des travaux publics de Belgique, décembre, p. 881.

Etude graphique du **prix de revient des transports automobiles.** (5 300 mots & fig.)

Bulletin de la Société alsacienne de constructions mécaniques. (Paris.)

1933 **621 .134.1**

Bull. de la Société alsacienne de Construct. mécaniq., octobre, p. 2.

GILLIOT (H.). — Le « **Booster** » pour locomotives. (2 400 mots & fig.)

Bulletin de la Société des ingénieurs civils de France. (Paris.)

1933 **691**

Bull. de la Soc. des Ing. civ. de France, juillet-août, p. 890.

ROCCA (A.). — La **protection extérieure des tuyaux métalliques** par des mélanges cimentés. L'enduit « Dalmine ». (12 600 mots & fig.)

1933 **691**

Bull. de la Soc. des Ing. civ. de France, juillet-août, p. 922.

SCARPA (O.). — La **corrosion de l'acier** et les essais physico-chimiques effectués sur le revêtement « Dalmine ». (11 700 mots & fig.)

Bulletin des transports internationaux par chemins de fer. (Berne.)

1933 **385 .113 (.43)**

Bull. des transp. intern. par ch. de fer, décembre, p. 582.

La **Compagnie du Chemin de fer du Reich** en 1932. (5 300 mots.)

1933 **313 .385 (.493)**

Bull. des transp. intern. par ch. de fer, décembre, p. 599.

La **Société Nationale ds Chemins de fer belges** durant l'exercice 1932. (1 000 mots.)

Bulletin technique de la Suisse romande. (Vevey

1933 **624**

Bull. techn. de la Suisse romande, nº 26, 23 décembre, p. 318.

SARRASIN (A.). — **Ponts récents en béton arm** (800 mots & fig.)

1934 **625 .111 (.49**

Bull. techn. de la Suisse romande, nº 1, 6 janvier, p.

PETTREQUIN (J.). — Importants **travaux** sur Viége-Zermatt. (700 mots & fig.)

1934 **624**

Bull. techn. de la Suisse romande, nº 2, 20 janvier, p. 13.

SARRASIN (A.). — **Ponts récents en béton arm** (900 mots & fig.)

1934 **625 .214 & 621**

Bull. techn. de la Suisse romande, nº 2, 20 janvier, p. 18.

WAETJEN (C. H.). — De l'importance de l'épaisseur minimum du film d'huile pour le **graissage** tionnel **des paliers.** (1 000 mots & fig.)

Bulletin technique de l'Union professionnelle des Inspecteurs techniques et des chefs de secti des chemins de fer belges. (Bruxelles.)

1933 **625 .14**

Bull. tech. de l'Union prof. des Inspecteurs tech. et Chefs de section des Ch. de fer belges, 15 cembre, p. 1.

CALLANT. — Les causes de **déformation de** voie. (3 000 mots & fig.)

Chronique des transports. (Paris.)

1934 **385 .1**

Chronique des Transports, nº 1, 10 janvier, p. 6.

Les **dépenses** des grands réseaux de chemins de en 1932. (3 500 mots.) (A suivre.)

Génie civil. (Paris.)

1933 **656 (.4**

Génie civil, nº 2680, 23 décembre, p. 624.

MESTRE (A.). — Un arrêt du Conseil d'Etat une règle départementale de **transports en commu** (1 100 mots.)

1933 **621 .335 (.65) & 621 .43 (.6**

Génie civil, nº 2681, 30 décembre, p. 633.

Locomotive Diesel à transmission électrique, 920 ch. du réseau algérien de la Compagnie P. L. (2 700 mots & fig.)

1933 62. (01 & 721 .1
nie civil, nº 2681, 30 décembre, p. 637.
CAUFOURIER (P.). — La **résistance des sols de ndation argileux.** Théorie et expérience de M. W. S. ousel. (2 800 mots & fig.)

1934 669 .1
nie civil, nº 2682, 6 janvier, p. 7; nº 2683, 13 janvier, p. 29; nº 2684, 20 janvier, p. 58.
UILLET (L.). — Les récents progrès de la **cémentation des aciers par le carbone.** (17 500 mots, 3 taaux & fig.) (A suivre.)

1934 625 .143.4
nie civil, nº 2682, 6 janvier, p. 20.
La pratique américaine du **rechargement des joints rails,** au chalumeau oxyacétylénique. (1 200 mots fig)

1934 691
nie civil, nº 2682, 6 janvier, p. 21.
LEBELLE (J.). — Les améliorations apportées au ton par l'emploi de la pervibration. (1 400 mots.)

1934 62. (01
énie civil, nº 2683, 13 janvier, p. 29.
La détermination par points, à l'aide des élastotres, de la **répartition des tensions dans les pièces étalliques.** (2 500 mots & fig.)

1934 656 .254 (.44) & 656 .283 (.44)
nie civil, nº 2684, 20 janvier, p. 58.
DANTIN (Ch.). — La catastrophe de Lagny, près de ris, et la **sécurité des transports sur voies ferrées.** 200 mots & fig.)

La Science et la Vie. (Paris.)

1934 621
Science et la Vie, janvier, p. 42.
CHARMEIL (A.). — La **précision mécanique** a créé ndustrie moderne : elle a engendré la « grande sé- ». (6 200 mots & fig.)

1934 691 & 669 .1
Science et la Vie, janvier, p. 76.
DEVAUX (P.). — Les **aciers inoxydables et semi-oxydables** dans l'industrie. (4 300 mots & fig.)

L'Économie internationale. (Paris.)

1933 656 .1 & 656 .2
Économie internationale, décembre, p. 3.
La **concurrence** entre la route et le rail. (3 200 mots.)

es Chemins de fer et les Tramways. (Paris.)

1934 621 .33
es Chemins de fer et les Tramways, janvier, p. 3.
SPIESS (E.). — **Electrifications.** (6 600 mots & fig.)

1934 621 .33
Les Chemins de fer et les Tramways, janvier, p. 8.
VALAT (E.). — Les méthodes d'étude du mouvement des **trains électriques** et leur application à la prédétermination du matériel de traction électrique et à sa bonne utilisation en service. (2 700 mots & fig.)

1934 621 .43
Les Chemins de fer et les Tramways, janvier, p. 11.
Dispositifs pour **locomotive Diesel-électrique.** (3 600 mots & fig.)

1934 621 .43
Les Chemins de fer et les Tramways, janvier, p. 13.
Transmission pneumatique pour **locomotives Diesel.** (600 mots.)

1934 621 .138.2
Les Chemins de fer et les Tramways, janvier, p. 14.
Alimentation mécanique des foyers de locomotives. (4 000 mots & fig.)

1934 625 .143.4
Les Chemins de fer et les Tramways, janvier, p. 19.
DESGARDES (E.). — Note concernant les **rondelles Grower.** (1 300 mots & fig.)

1934 625 .174 (.44)
Les Chemins de fer et les Tramways, janvier, p. 20.
Emploi et fonctionnement du **chasse-neige** sur les réseaux français. (1 300 mots.)

1934 625 .255
Les Chemins de fer et les Tramways, janvier, p. 21.
Dispositifs de montage pour **freins électro-magnétiques.** (2 700 mots & fig.)

1934 625 .17
Les Chemins de fer et les Tramways, janvier, p. 23.
Appareil pour le dégarnissage et le relevage sur **ballast des voies ferrées.** (1 200 mots & fig.)

L'Industrie des voies ferrées et des transports automobiles. (Paris.)

1933 621 .332
L'Industrie des voies ferrées et des transp. autom., novembre, p. 337.
SEKUTOWICZ. — Note sur le **retour par la terre des courants de traction** et les effets d'électrolyse des canalisations. (1 700 mots & fig.)

1933 625 .62
L'Industrie des voies ferrées et des transp. autom., novembre, p. 348.
Nouvelle voiture-type élaborée par le Bureau technique de la Conférence des Présidents des compagnies de tramways aux Etats-Unis. (1 400 mots et fig.)

1933 625 .616 & 625 .617
L'Industrie des voies ferrées et des transp. autom., novembre, p. 86.
LAURU. — **Construction métallique** d'automotrices et de remorques dans le réseau de Bordeaux. (4 500 mots & fig.)

Revue générale des chemins de fer. (Paris.)

1934 **621 .133.1**

Revue générale des chemins de fer, janvier, p. 3.

DUGAS (R.). — Analyses et essais des combustibles destinés à la **consommation des locomotives.** (7 700 mots & 3 tableaux.)

1934 **625 .13 (.44)**

Revue générale des chemins de fer, janvier, p. 17.

OUDOTTE. — Construction de galeries couvertes et d'ouvrages d'art pour la **protection contre les avalanches,** de la ligne de St-Gervais-les-Bains-Le Fayet à la frontière suisse. (3 900 mots & fig.)

1934 **313 .385 (.44)**

Revue générale des chemins de fer, janvier, p. 26.

Résultats obtenus en 1932 sur le réseau des Chemins de fer de l'Etat en France d'après le compte d'administration publié pour ladite année. (Tableaux.)

1934 **656 .259 (.44)**

Revue générale des chemins de fer, janvier, p. 55.

Signalisation du terminus de Puteaux pour la ligne des Moulineaux. (1 200 mots & fig.)

1934 **621 .132.8 (.437) & 621 .43 (.437)**

Revue générale des chemins de fer, janvier, p. 58.

Le développement des **automotrices** sur les Chemins de fer de l'Etat tchécoslovaque. (2 200 mots & fig.)

1934 **385. (09 (.56)**

Revue générale des chemins de fer, janvier, p. 65.

Le **développement** des Chemins de fer turcs depuis dix ans. (1 000 mots & fig.)

Revue universelle des Mines. (Liége.)

1934 **621 .43**

Revue universelle des mines, nº 1, 1er janvier, p. 11.

MAGNÉE (P.). — Les **automotrices à moteur Diesel** de la Société des Aciéries du Nord. (1 400 mots & fig.)

In German.

Die Lokomotive. (Wien).

1933 **621 .335 (.43)**

Die Lokomotive, Dezember, S. 221.

Neue **elektrische Lokomotiven und Triebwagen** für die Süddeutschen Strecken der Deutschen Reichsbahn. (1 200 Wörter & Abb.)

1933 **621 .13 (.47)**

Die Lokomotive, Dezember, S. 231.

Neues vom russischen **Lokomotivbau. II.** (1 400 Wörter.)

Elektrische Bahnen. (Berlin.)

1933 **621 .43 (.43)**

Elektrischen Bahnen, Dezember, S. 277.

REICHEL (W.). — Die **elektrische Ausrüstung des Schnelltriebwagens** der Deutschen Reichsbahn. (3 500 Wörter & Abb.)

1933 **621 .335 (.43)**

Elektrische Bahnen, Dezember, S. 280.

MICHEL (O.) & HEYDMANN (M.). — Die **Verschiebelokomotive Bauart A 1 A — A 1 A** Reihe E 8 der Deutschen Reichsbahn. (4 300 Wörter & Abb.)

1933 **621 .33 (.73**

Elektrische Bahnen, Dezember, S. 288.

SCHMITT (H.). — Der **elektrische Betrieb** d Eisenbahnen von New York. (1 500 Wörter, 3 Tabellen & Abb.)

1933 **621 .33**

Elektrische Bahnen, Dezember, S. 292.

SCHWEIGER (L.).— **Lüftungsgitter** für elektrisch Lokomotiven. (800 Wörter & Abb.)

Glasers Annalen. (Berlin.)

1933 **621 .132.8 (.4**

Glasers Annalen, Heft 11, 1. Dezember, S. 86.

KÜSEL. — **Lastkraftwagen** der Deutschen Reichsbahn. (3 500 Wörter & Abb.)

1933 **624. (0 & 385. (072 (.4**

Glasers Annalen, Heft 11, 1. Dezember, S. 89.

ROSTECK (W.). — Anwendbarkeit zerstörungfreier **Prüfverfahren im Brückenbau** unter besonderer Berücksichtigung der Röntgendurchstrahlung. (2 7 Wörter & Abb.)

1933 **621 .131**

Glasers Annalen, Heft 11, 1. Dezember, S. 93.

FARMAKOWSKY (W.). — Über die **Reibungszugkraftgrenze** der Dampflokomotive. (2 000 Wörter Abb.)

1933 **621 .132**

Glasers Annalen, Heft 11, 1. Dezember, S. 95.

METZELTIN. — **Dampflokomotiven** Bauart Franco (900 Wörter & Abb.)

1933 **6**

Glasers Annalen, Heft 12, 15. Dezember, S. 105.

GUERTLER. — Die **Hartmetalle.** (800 Wörter Abb.)

Organ für die Fortschritte des Eisenbahnwesens (Berlin.)

1934 **621 .132.8 (.71 + .7**
& 621 .43 (.71 + .7

Organ für die Fortschritte des Eisenbahnwesens, H 1/2, 10. Januar, S. 1.

WITTE (Fr.). — Die **Entwicklung des Triebwage mit eigener Kraftquelle in den Vereinigten Staat und Kanada.** (11 000 Wörter, 3 Tafeln & Abb.)

1934 **621 .43 (.43**

Organ für die Fortschritte des Eisenbahnwesens, H 1/2, 10. Januar, S. 17.

DORNER (H.). — **Entwicklung des Triebwagbaues** bei den Kgl. Ungarischen Staatseisenbahn (3 800 Wörter, 3 Tafeln & Abb.)

1934 **621 .43 (.4)**

rgan für die Fortschritte des Eisenbahnwesens, Heft 1/2, 10. Januar, S. 23.

SPIES (R.). — Neue **Verbrennungstriebwagen** nglischer, französischer, italienischer, belgischer und inischer Bauart. (5 600 Wörter, 1 Tafel & Abb.)

1934 **625 .2**

rgan für die Fortschritte des Eisenbahnwesens, Heft 1/2, 10. Januar, S. 31.

OTTO (K.). — Fortschritte in der Anwendung des **eichtbaues** auf die Personenwagen. Verbrennungs- iebwagen und Beiwagen der Deutschen Reichsbahn. 000 Wörter & Abb.)

---

eitschrift des Vereines Deutscher Ingenieure. (Berlin.)

1933 **62. (01**

eitsch. des Ver. deutsch. Ing., Nr. 51, 23. Dezember, S. 1345.

SIEBEL (E.) & MAIER (A.). — Der Einfluss ehrachsiger Spannungszustände auf das **Formände- ngsvermögen metallischer Werkstoffe.** (2 900 Wör- r & Abb.)

1933 **669**

eitsch. des Ver. deutsch. Ing., Nr. 51, 23. Dezember, S. 1355.

HARTL (W.). — Konstruktionstechnik von **Leicht- etall-Gusstücken.** (2 900 Wörter & Abb.)

1933 **621 .43 (.43)**

eitsch. des Ver. deutsch. Ing., Nr. 51, 23. Dezember, S. 1365.

Triebwagen der Deutschen Reichsbahn. (300 Wörter Abb.)

1934 **691**

eitsch. des Ver. deutsch. Ing., Nr. 1, 6. Januar, S. 23.

SCHULZE (A.). — Verhalten verschiedener Bau- eisen im Feuer und Wirkung von **Holzschutzmitteln.** 100 Wörter & Abb.)

1934 **621 .83**

eitsch. des Ver. deutsch. Ing., Nr. 1, 6. Januar, S. 53.

ULRICH (M.). — Zur Frage der Grübchenbildung ei **Zahnrädern.** (1 900 Wörter & Abb.)

1934 **621 .132.8**

eitsch. des Ver. deutsch. Ing., Nr. 3, 20. Januar, S. 65.

IMFELD (K.) & ROOSEN (R.). — Neue **Dampf- hrzeuge.** (700 Wörter & Abb.)

Zeitschrift für das gesamte Eisenbahn-Sicherungswesen. (Berlin.)

1934 **656 .25**

eitsch. für das gesamte Eisenb.-Sicherungsw., Nr. 1, 10. Januar, S. 3.

BUDDENBERG. — Die **Propangas - Dauerbrand- gnallaterne.** (3 400 Wörter & Abb.)

1934 **656 .255**

Zeitsch. für das gesamte Eisenb.-Sicherungsw., Nr. 1, 10. Januar, S. 8.

SALEMANN (W.). — **Verkehrsregelung** auf ein- gleisigen Strecken der Estnischen Staatsbahnen. (2 200 Wörter & Abb.)

Zeitung des Vereins mitteleuropäischer Eisenbahnverwaltungen. (Berlin.)

1933 **625 .162 & 656 .264**

Zeitung des Vereins mitteleurop. Eisenbahnverw., Nr. 51, 21 Dezember, S. 1033; Nr. 52, 28 Dezem- S. 1056.

HANKER (R.). — Die **Sicherung der schienengleichen Kreuzungen** von Eisenbahn und Strasse. (7 400 Wörter & Abb.)

1934 **385 (.3)**

Zeitung des Vereins mitteleurop. Eisenbahnverw., Nr. 1, 4. Januar, S. 1; Nr. 2, 11. Januar, S. 37.

WULFF. — **Rückblick** auf das Jahr 1933 (42 500 Wörter.)

1934 **656 .2**

Zeitung des Vereins mitteleurop. Eisenbahnverw., Nr. 3, 18. Januar, S. 61.

LEIBBRAND. — Aufgaben und technische Grund- lagen der Weiterentwicklung des **Eisenbahnbetriebs.** (7 600 Wörter.)

In English.

Bulletin, American Railway Engineering Association. (Chicago, Ill.)

1933 **016 .621.39 (.73)**

Bull. Amer. Ry. Engineering Asson, September, p. 3.

Report of Committee I. — **Developments in application of electricity to railway service.** Bibliography of periodical articles appearing in a select list of periodi- cals covering the period January 1932 to June 1933, prepared by E. A. Freeman, cataloger, under the direction of the Librarian, Bureau of Railway Econo- mics Library, Washington, D. C.

1933 **621 .39 (.73)**

Bull. Amer. Ry. Engineering Asson, September, p. 23.

Report of Committee II. — **Inductive coordination.** (3 600 words.)

1933 **621 .33 (.73) & 621 .39 (.73)**

Bull. Amer. Ry. Engineering Asson, September, p. 33.

Report of Committee IV. — **Power supply.** (2 800 words.)

1933 **621 .39 (.73)**

Bull. Amer. Ry. Engineering Asson, September, p. 43.

Report of Committee VIII. — **Electric heating.** (7 000 words & fig.)

1933 **621 .31 (.73)**
Bull., Amer. Ry. Engineering Asson, September, p. 62.
Report of Committee IX. — Application of different types of **motors**, both standard and special, **for other uses than rolling stock.** (7 000 words & fig.)

1933 **621 .336 (.73)**
Bull., Amer. Ry. Engineering Asson, September, p. 82.
Report of Committee X. — Clearances for **third rail and overhead working conductors.** (400 words & tables.)

1933 **621 .39 & 693**
Bull., Amer. Ry. Engineering Asson, September, p. 92.
Report of Committee XI. — **Protection of railroad equipment from danger of fire caused by electric sparks** during the transfer of inflammable liquids. (1 000 words.)

1933 **621 .32 (.73)**
Bull., Amer. Ry. Engineering Asson, September, p. 95.
Report of Committee XIII. — **Illumination.** (1 600 words.)

1933 **621 .331 (.73)**
Bull., Amer. Ry. Engineering Asson, September, p. 98.
Report of Committee XIV. — Design of **indoor and outdoor substations.** (3 800 words.)

1933 **621 .39 (.73) & 669 (.73)**
Bull., Amer. Ry. Engineering Asson, September, p. 106.
Report of Committee XVI. — **Application of corrosion resisting material to railroad electrical construction.** (2 200 words, 12 tables & fig.)

Engineer. (London.)

1933 **624 .8**
Engineer, No. 4065, December 8, p. 562; No. 4066, December 15, p. 586.
TRATMAN (E. E. R.). — **Vertical-lift drawbridges.** (9 200 words & fig.)

1933 **621 .31**
Engineer, No. 4065, December 8, p. 564; No. 4066, December 15, p. 600; No. 4067, December 22, p. 612; No. 4068, December 29, p. 638.
A. C. voltage regulators. (15 700 words & fig.)

1933 **621 .133.1**
Engineer, No. 4065, December 8, p. 568.
DUNLOP (S. H.). — **Liquid fuels from coal** for naval purposes. (3 900 words.)

1933 **621 .335 (.82) & 621 .43 (.82)**
Engineer, No. 4065, December 8, p. 579.
SACCAGGIO (P. C.). — **Diesel electric units** for the Buenos Aires Great Southern Railway. (5 900 words.)

1933 **621 .132.3 (.73)**
Engineer, No. 4067, December 22, p. 614; No. 4068, December 29, p. 636.
POULTNEY (E. C.). — Recent **American express locomotives.** (10 700 words & fig.)

1933 **621 .18 (.73**
Engineer, No. 4067, December 22, p. 619.
THOMPSON (P. W.) & VAN DUZER (R. M.). — **High-temperature steam experience at Detroit.** (5 50 words & 1 table.)

1933 **621 .335 (.42) & 621 .43 (.42**
Engineer, No. 4067, December 22, p. 627.
200 h. p. **oil-electric rail coach.** (2 000 words, 1 tabl & fig.)

1933 **621 .39**
Engineer, No. 4068, December 29, p. 652.
A recording insulation tester. (700 words & fig.)

1934 **621 .16**
Engineer, No. 4069, January 5, p. 2.
The development of the Parsons **steam turbin** (3 600 words & fig.)

1934 **621 .13, 621 .335 & 621 .4**
Engineer, No. 4069, January 5, p. 8.
Road and rail in 1933. (2 300 words & fig.)

1934 **621 .1**
Engineer, No. 4069, January 5, p. 22.
New **locomotives** of 1933. (1 400 words & fig.)

1934 **62**
Engineer, No 4069, January 5. p. 23.
Bridge construction in 1933. (4 400 words & fig.)

Engineering. (London.)

1933 **62. (01 & 669**
Engineering, No. 3543, December 8, p. 623; No. 354 December 15, p. 647.
McKAY (A. M.). — **The effect of time and tempe ature on the embrittling of steels.** (3 800 words & fig

1933 **656. (061 (.42**
Engineering, No. 3543, December 8, p. 637.
The Public Works, Roads and Transport Exhibitio (2 800 words & fig.)

1933 **621 .31 (.44**
Engineering, No. 3544, December 15, p. 642; No. 354 December 22, p. 669.
RICH (Th.). — **Hydro-electric developments** at I Truyère, France. (8 500 words & fig.)

1933 **536 & 621 .11**
Engineering, No. 3544, December 15, p. 661; No. 354 December 22, p. 673.
THOMPSON (P. W.) & VAN DUZER (R. M.). — **High-temperature steam experience at Detroit.** (7 7 words, fig & tables.)

1933 **621 .43 (.82**
Engineering, No. 3544, December 15, p. 668.
Diesel-electric operating experiences on the Buen Aires Great Southern Railway. (2 400 words.)

1933 **621 (06 (∞), 621 .33 (∞) & 621 .43**
ngineering, No. 3545, December 22. p. 678.
The Scandinavian sectional meeting of the **World wer Conference.** Short analyses of papers presented. 300 words.)

1933 **621 .335 (.42) & 621 .43 (.42)**
ngineering. No. 3545, December 22, p. 690.
200-H.P. **Diesel-electric railcar.** (1 100 words & fig.)

1933 **621 .392 (.945) & 625 .13 (.945)**
ngineering. No. 3545, December 22, p. 695.
Railway bridge strengthening by welding. (600 ords & fig.)

1933 **62. (01 & 621 .392**
ngineering, No. 3546, December 29, p. 699.
CHARD (F. de la C.). — **Electrical recording ex-nsometer.** (1 400 words & fig.)

1933 **51. (08 & 721 .2**
ngineering, No. 3546, December 29, p. 710.
REDDINGTON (C. G.). — **Nomogram** for minimum ction trapezoidal **mass concrete retaining walls.** (400 ords & fig.)

1933 **669**
ngineering, No. 3546, December 29, p. 725.
ROSENHAIN (W.). — Some steps in **metallurgical** ogress, **1908-1933.** Paper read before the Institute Metals, Birmingham, September 19, **1933.** (7 700 ords.)

1934 **62. (01**
ngineering, No. 3547, January 5, p. 1.
JAKEMAN (C.). — **The testing of steam pipe heat sulating materials.** (4 000 words & fig.)

1934 **693 & 721 .3**
ngineering, No. 3547, January 5, p. 5.
The fire **protection of steel columns** with gypsum. 300 words.)

1934 **621 .165**
ngineering, No. 3547, January 5, p. 23.
CARTER (W. A.) & ELLENWOOD (F. O.). — The ermal performance of the Detroit **turbine using eam at 1 000 deg. Fahr.** (3 700 words & fig.)

Engineering News-Record. (New York.)

1933 **624 .1 (.73) & 625 .13 (.73)**
gineering News-Record, No. 22, November 30. p. 641.
GILMAN (G. T.). — **Railroad viaduct carried rough occupied building.** (3 000 words & fig.)

1933 **625 .13 (.54)**
gineering News-Record. No. 22. November 30. p. 658.
EVERALL (W. T.). — Extra **trusses** added to Indus ver bridge. (650 words & fig.)

1933 **656 .211.4 (.73) & 725 .3 (.73)**
gineering News-Record. No. 23. December 7. p. 671.
Electrified rail terminal in Downstown St. Louis 000 words & fig.)

1933 **625 .13 & 656 .284**
Engineering News-Record, No., 23, December 7, p. 687.
Two **railroad bridge failures** laid to inadequate inspection. (1 600 words & fig.)

1934 **624. (0**
Engineering News-Record, No. 26, December 28, p. 783.
Structural-aluminium practices on the Smithfield Street bridge. (2 500 words & fig.)

Journal, Institution of Engineers, Australia. (Sydney, N. S. W.)

1933 **62. (01 & 721 .9**
Journal, Institut. of Eng., Australia, October, p. 325.
JAMIESON (L. N.). — **The rupture of concrete and the estimation of working stresses.** (5 200 words & fig.)

1933 **621 .133.2, 621 .138.5 & 665 .882**
Journal, Institut. of Eng., Australia, October, p. 332.
HARRISON (F. H.). — **Copper welding applied to locomotive repairs.** (7 500 words & fig.)

1933 **721 .9 & 725 .36**
Journal, Institut. of Eng., Australia, November, p. 388.
BOYD MERCER (L.). — Economical methods of **designing and constructing concrete grain bins.** (3 400 words & fig.)

Journal, Institute of Transport. (London.)

1933 **656 .2 (.47)**
Journal, Institute of Transport, December, p. 98.
CAMPBELL (C. D.) & MILLER (M. S.). — **Railway transportation** in Soviet Russia. (9 000 words & tables.)

1934 **627 & 656 .213**
Journal, Institute of Transport, December, p. 132.
BROWN (F.). — **Port reorganisation.** — A national problem. (5 700 words.)

1934 **385 .1 & 657**
Journal, Institute of Transport, December, p. 140.
ROWLAND (S. W.). — **Transport finance and accounting.** (12 000 words.)

1934 **385 .1 & 656**
Journal, Institute of Transport, December, p. 156.
HARVERSON (P.A.). — « Whither ? ». (5 700 words.)

Great Western Railway Magazine. (London.)

1934 **385. (08 (.42)**
Great Western Railway Magazine, January, p. 6.
A review of the past year's work in the principal departments. (12 000 words.)

Mechanical Engineering. (New York.)

1933 **621 .43 (.73) & 625 .235 (.73)**
Mechanical Engineering, December, p. 735.
ADAMS (E. E.). — **Light-weight, high-speed passenger trains.** (4 800 words & fig.)

1933 **621 .1 & 621 .31**
Mechanical Engineering, December, p. 741.
DRAKE HARKINS (H.). — **Interchanging steam and electric power.** (7 700 words & fig.)

Proceedings, American Society of Civil Engineers (New York.)

1933 **62. (01**
Proceed., Amer. Soc. of Civil Eng., September, p. 1121.
BEYER (A. H.) & SOLAKIAN (A. G.). — **Photo-elastic analysis of stresses in composite materials.** (2 700 words, 2 tables & fig.)

1933 **721 .9**
Proceed., Amer. Soc. of Civil Eng., December, p. 1601.
Wind-bracing in steel buildings. Third progress report of Sub-Committee No. 31, committee on steel of the structural division. (14 000 words, 8 tables & fig.)

1933 **693 & 721 .9**
Proceed., Amer. Soc. of Civil Eng., December, p. 1637.
HANSEN (J. H.). — Developments in **reinforced brick masonry.** (Discussion.) (500 words.)

Railway Age. (New York.)

1933 **656 .257 (.73)**
Railway Age, No. 23, December 2, p. 782.
OPPELT (J. H.). — An **interlocking** six miles long. (1 200 words & fig.)

1933 **691 & 693**
Railway Age, No. 23, December 2, p. 785.
Piers given thorough protection against substructure fires. (2 300 words & fig.)

1933 **621 .43 (.73)**
Railway Age, No. 23, December 2, p. 789.
CANDEE (A. H.). — Performance of **Diesel locomotives.** (1 500 words & fig.)

1933 **625 .27 (.73)**
Railway Age, No. 23, December 2, p. 791.
Norfolk & Western **cuts empty mileage in material handling.** (1 400 words.)

1933 **625 .234 (.73)**
Railway Age, No. 23, December 2, p. 793.
New Haven club cars equipped with **air conditioning.** (600 words & fig.)

1933 **621 .133.1 (.7**
Railway Age, No. 23, December 2, p. 795.
Heat treatment changes the burning qualities pulverised coal. (1 800 words & fig.)

1933 **625 .232 (.7**
Railway Age, No. 23, December 2, p. 797.
New car an aid in soliciting group travel. (800 wo & fig.)

1933 **625 .24 (0 (.73) & 656 .223.2 (.7**
Railway Age, No. 24, December 9, p. 812.
Are smaller freight cars needed ? Traffic develo ment series. Article No. 14. (2 700 words & fig.)

1933 **625 .235 & 625 .2**
Railway Age, No. 24, December 9, p. 815.
FOOTE (F. D.). — **Steel and its relation to t railway equipement problem.** (3 100 words.)

1933 **385 .1 (.7**
Railway Age, No. 24, December 9, p. 821.
Prospects good for Public Works Administrati loans. (3 000 words.)

1933 **625 .13 (.7**
Railway Age. No. 25, December 16, p. 843.
Pennsylvania builds 22 **subways** in 1 1/2 miles line. (2 700 words & fig.)

1933 **621 .43 (.7**
Railway Age, No. 25, December 16, p. 847.
Pneumatic-tired rail bus tested. (1 600 words & fig

1933 **385 .51 (.7**
Railway Age, No. 25, December 16, p. 849.
Co-ordinator Eastman warns roads on **labor rel tions.** (3 000 words.)

1933 **347 .765 (.42 + .7**
& 656 .1 (.72 + .7
Railway Age, No. 25, December 16, p. 853.
Transport chaos ended in Britain. Trucks as w as buses now regulated. — Similar step in U. S. essential to economic recovery. (4 500 words.)

1933 **656 .222**
Railway Age, No. 26, December 23, p. 872.
Is speed what shippers want ? Traffic developme series. Article No. 15. (3 000 words.)

1933 **621 .132.3 (.7**
Railway Age, No. 26, December 23, p. 875.
Milwaukee **motive power makes high mileage.** (1 3 words, tables & fig.)

1933 **385 .1 (.73) & 385 .3 (.7**
Railway Age, No. 26, December 23, p. 880.
Railroads express views on **transportation legis tion.** (3 500 words.)

1933 **656 .261 (.7**
Railway Age, No. 26, December 23, p. 884.
Some questions and answers on storedoor servi (3 200 words.)

Railway Engineer. (London.)

1933 **625 .13**
ilway Engineer, November, p. 322.
WARD (I. L.). — **Length of transition curves.** (300 rds & diagrams.)

1933 **625 .212**
ilway Engineer, November, p. 324.
Independent wheels on railway axles. (450 words fig.)

1933 **625 .18 (.42) & 725 .35 (.42)**
ilway Engineer, November, p. 325.
Engineer's depots, London Underground Railways. 000 words & fig.)

1933 **625 .144.2**
ilway Engineer, November, p. 334.
PETERS (R.). — **The application of cant to rail-y tracks.** (1 900 words & fig.)

1933 **625 .143.2 & 625 .143.3**
ilway Engineer, November, p. 337.
ALLEN (C. J.). — **The burden of defective rails.** 500 words & tables.)

1933 **621 .9**
ilway Engineer, November, p. 341.
Automatic sleeper chair screwing machine. (600 rds & fig.)

1933 **625 .13 (.71**
ilway Engineer, November, p. 341.
New Vancouver **tunnel.** (700 words & fig.)

1933 **621 .134.1**
ilway Engineer, November, p. 342.
Metallic packings for high pressures. (1 700 words fig.)

1933 **625 .7 (.43)**
ilway Engineer, November, p. 344.
Maintenance organisation on the German State ilway. (1 600 words.)

1933 **625 .143.3 & 625 .143.4**
ilway Engineer, November, p. 346.
BALL (J. D. W.). — **Measuring wear of rails and hplates.** (1 200 words & fig.)

1933 **656 .281 (.42)**
ilway Engineer, November, p. 348.
Railway accident report. — Derailment at Raynes rk, Southern Railway : May 25, 1933. (2 000 words.)

1933 **621 .138.5 (.42) & 625 .26 (.42)**
ilway Engineer, December, p. 353.
The railway workshop and its equipment. (1 000 rds.)

1933 **621 .138.5 (.42) & 625 .26 (.42)**
ilway Engineer, December, p. 354.
Some recent improvements at Swindon Works, reat Western Railway. (2 000 words & fig.)

1933 **621 .138.5 (.42)**
Railway Engineer, December, p. 359.
Economical machining methods in the L. M. S. R. **locomotive works.** (2 100 words & fig.)

1933 **621 .138.5 (.42)**
Railway Engineer, December, p. 363.
Reorganised production methods at the Darlington **works** of the L. N. E. R. (1 500 words & fig.)

1933 **621 .138.5 (.42)**
Railway Engineer, December, p. 365.
Jig, fixture, and gauge organisation at Eastleigh works, Southern Railway. (1 200 words & fig.)

1934 **621 .133**
Railway Engineer, January, p. 4.
RIEKIE (J.). — **Slow combustion steam generation** on the flash system **for locomotives.** (1 600 words & fig.)

1934 **621 .133.7**
Railway Engineer, January, p. 6.
Boiler water treatment. (900 words.)

1934 **627**
Railway Engineer, January, p. 7.
BIRD (H. H.). — **Dock entrances and lock gates.** (2 000 words & fig.)

1934 **621 .132.1 (.47)**
Railway Engineer, January, p. 9.
Recent **Russian locomotives.** (500 words, 1 table & fig.)

1934 **625 .13 (.42)**
Railway Engineer, January, p. 11.
Replacement of an old timber viaduct. (900 words & fig.)

1934 **625 .232 (.45)**
Railway Engineer, January, p. 13.
New **light-weight Italian coaches.** (600 words & fig.)

1934 **665 .882 & 669 .3**
Railway Engineer, January, p. 15.
DOWNIE (C. C.). — Practical **welding of copper tubes.** (1 000 words.)

1934 **621 .132.3 (.51)**
Railway Engineer, January, p. 17.
New **Pacific locomotives** for China. (400 words & fig.)

1934 **656 .254 (.43)**
Railway Engineer, January, p. 18.
Optical train control. (3 200 words & fig.)

1934 **621 .135.2 (.73)**
Railway Engineer, January, p. 22.
New disc-type wheel centres for coupled wheels, (1 000 words & fig.)

1934 **656 .254 (.44)**
Railway Engineer, January, p. 24.
Centralised traffic control in France. (900 words & fig.)

Railway Engineering and Maintenance. (New York.)

1933 **625 .144 (.73) & 625 .173 (.73)**
Railw. Engineering and Maintenance, December, p. 586.
884 000 tons of **rail — How will it be laid ?** Determination of the methods and **equipment that will produce the greatest efficiency.** (3 000 words & fig.)

1933 **691 & 693**
Railw. Engineering and Maintenance, December, p. 590.
Acute **waterproofing** problem solved. (1 500 words & fig.)

1933 **614 .8 (.73)**
Railw. Engineering and Maintenance, December, p. 594.
WENDLING (G. C.). — Solving the **safety problem** on the Louisville and Nashville. (2 500 words & fig.)

1933 **625 .113**
Railw. Engineering and Maintenance, December, p. 596.
String lining curves without stakes. (600 words & fig.)

1933 **625 .113**
Railw. Engineering and Maintenance, December, p. 597.
SMYTHE (H. L.). — **Simplifying vertical curve calculations.** (2 000 words & fig.)

1933 **625 .143.2 (.73)**
Railw. Engineering and Maintenance, December, p. 601.
CRITCHETT (J. H.). — A new process for **heat treating rail ends.** (1 000 words.)

Railway Gazette. (London.)

1933 **656 .257 (.44)**
Railway Gazette, No. 23, December 8, p. 861.
Route-lever signalling in France. (1 200 words & fig.)

1933 **621 .43**
Railway Gazette, No. 23, December 8, p. 864.
Pullman high-speed railcar. (400 words & fig.)

1933 **621 .9 (.42) & 625 .144 (.42)**
Railway Gazette, No. 24, December 15, p. 885.
Chairing sleepers automatically. (700 words & fig.)

1933 **656 .211.7 (.51)**
Railway Gazette, No. 24, December 15, p. 887.
Nanking-Pukow **train ferry.** (900 words & fig.)

1933 **621 .43 & 625 .212**
Railway Gazette, No. 24, December 15, p. 889.
New **wheel for rubber-tyred railcars.** (1 100 words & fig.)

1933 **621 .132.3 (.931)**
Railway Gazette, No. 24, December 15, p. 891.
Hudson type (3 ft. 6 in. gauge 4-8-4, K class) locomotive in New Zealand. (400 words & fig.)

1933 **656 .222.1 (∞**
Railway Gazette, No. 24, December 15, p. 896.
The fastest long-distance trains in the world. (1 2
words & tables.)

1933 **621 .132.3 (.44) & 621 .132.5 (.4**
Railway Gazette, No. 25, December 29, p. 964.
Another remarkable French locomotive. New **2-10 four-cylinder compound locomotive** for the Northe
Railway of France for fast and heavy goods a
passenger trains. (900 words & fig.)

1933 **625 .232 (.8**
Railway Gazette, No. 25, December 29, p. 967.
Buffet saloons in Argentina. (200 words & fig.)

1934 **656 .25 (.4**
Railway Gazette, No. 1, January 5, p. 5.
French **railway safety.** (2 400 words.)

1934 **621 .43 (.8**
Railway Gazette, No. 1, January 5, p. 13.
Railcars in Argentina. (2 400 words & fig.)

1934 **621 .138.3 (.4**
Railway Gazette, No. 1, January 5, p. 18.
Spray cleaning of locomotives. (1 000 words & fig

1933 **621 .33 (.4**
Electric Railway Traction, p. 910, Supplt. to the Ra
way Gazette, December 15.
Main-line and suburban extensions to Southe Railway electrified system. (1 000 words, 1 tab & fig.)

1933 **621 .335 & 656 .2**
Electric Railway Traction, p. 913, Supplt. to the Ra
way Gazette, December 15.
Electric locomotive resistance. (600 words & fig.)

1933 **621 .33 (.49**
Electric Railway Traction, p. 914, Supplt. to the Ra
way Gazette, December 15.
Swiss private railway conversion. — Appenzell Ra
way changes over from steam and Diesel to electr
traction on mountain line. (1 200 words & fig.)

1933 **621 .33 (.48**
Electric Railway Traction, p. 916, Supplt. to the Ra
way Gazette, December 15.
Swedish State Railway **electrification.** (2 600 wor
& fig.)

1933 **621 .33**
Diesel Railway Traction, p. 980, Supplt. to the
way Gazette, December 15.
Electrification and economy. (2 400 words.)

1933 **621 .33 (.4**
Electric Railway Traction, p. 922, Supplt. to the Ra
way Gazette, December 15.
Railway electrification in the U. S. S. R. (2 2
words, tables & fig.)

1933 **621 .43 (.42)**
esel Railway Traction, p. 987, Supplt. to the Ry. Gazette, December 29.
British developments in **Diesel traction.** (1 500 words fig.)

1933 **313 : 621 .43 (.4)**
esel Railway Traction, p. 982, Supplt. to the Ry. Gazette, December 29.
Diesel orders in 1933. (150 words & 2 tables.)

1933 **621 .335 (.65) & 621 .43 (.65)**
esel Railway Traction, p. 983, Supplt. to the Ry. Gazette, 29 December.
Mixed-traffic locomotive for North America. (700 ords & fig.)

1933 **621 .43 (.44)**
esel Railway Traction, p. 984, Supplt. to the Ry. Gazette, 29 December.
French railcar practice. — Light vehicles recapture st traffic on the seven big railways. (1 900 words fig.)

1933 **621 .335 (.42) & 621 .43 (.42)**
iesel Railway Traction, p. 987, Supplt. to the Ry. Gazette, 29 December.
A British **Diesel engine** development. (400 words, table & fig.)

1933 **621 .132.7 & 621 .43**
iesel Railway Traction, p. 988, Supplt. to the Ry. Gazette, 29 December.
L. M. S. R. acquires another **shunting locomotive.** 000 words & fig.)

1933 **621 .43**
iesel Railway Traction, p. 990, Supplt. to the Ry. Gazette, 29 December.
Progress of Diesel railway traction. — Over 250 oil-gines units aggregating 60 000 B. H. P. set to work the world's railways during 1933. (1 800 words fig.)

1933 **621 .43 (.42)**
iesel Railway Traction, p. 994, Supplt. to the Ry. Gazette, 29 December.
Future British **Diesel vehicles.** (400 words & fig.)

1933 **621 .43 (.492)**
Diesel Railway Traction, p. 995, Supplt. to the Ry. Gazette, 29 December.
Diesel railcars in Holland. (1 200 words.)

1933 **621 .335 (.42) & 621 .43 (.42)**
iesel Railway Traction, p. 996, Supplt. to the Ry. Gazette, 29 December.
Another British **railcar.** (1 000 words & fig.)

1933 **621 .43**
iesel Railway Traction, p. 998, Supplt. to the Ry. Gazette, 29 December.
The status of the locomotive **Diesel engine.** A review the present position and future tendencies. (2 200 ords. 1 table & fig.)

Railway Magazine. (London.)

1934 **621 .133.7 (.42)**
Railway Magazine, January, p. 5.
Water pick-up troughs. (700 words & fig.)

1934 **656 .222.1 (.42)**
Railway Magazine, January, p. 11.
ALLEN (C. J.). — **British locomotive practice and performance.** (4 400 words & fig.)

1934 **621 .132.3 (.42 + .73)**
Railway Magazine, January, p. 38.
The finish of the Royal Scot tour. (850 words & fig.)

Railway Signaling. (Chicago.)

1933 **656 .255 (.73)**
Railway Signaling, December, p. 317.
Tunnel operation on Northern Pacific is remotely controlled. (1 600 words & fig.)

1933 **625 .143.4 (.73) & 656 .256 (.73)**
Railway Signaling, December, p. 319.
Track circuits without bonds. (1 300 words & fig.)

1933 **656 .258 (.73)**
Railway Signaling, December, p. 322.
Automatic interlocking eliminates train stops. (1 800 words & fig.)

1933 **656 .254 (.73)**
Railway Signaling, December, p. 326.
STEVENS (Ch. H.). — **Centralized traffic control in Philadelphia subway.** (3 000 words & fig.)

1933 **625 .162 & 656 .259**
Railway Signaling, December, p. 331.
Automatic crossing gates on Illinois Central. (1 600 words & fig.)

1933 **656 .254 (.73)**
Railway Signaling, December, p. 333.
Boston and Maine **train-control** petition granted. (1 900 words.)

The Locomotive. (London.)

1933 **621 .335 (.81) & 621 .43 (.81)**
The Locomotive, No. 496, December 15, p. 347.
Oil electric train, Sao Paulo Railway of Brazil. (1 300 words & fig.)

1933 **621 .131.3 (.44)**
The Locomotive, No. 496, December 15, p. 355.
Locomotive testing plant at Vitry-sur-Seine, France. (3 200 words & fig.)

1933 **621 .135.2 & 625 .214**
The Locomotive, No. 496, December 15, p. 365.
The **roller bearing** as applied to locomotives and rolling stock on railways. (2 300 words.)

1933 **621 .335 (.42) & 621 .43 (.42)**
The Locomotive, No. 496, December 15, p. 367.
Mixed traffic oil-electric locomotive tried on L. N. E. Ry. (1 600 words & fig.)

1933 **621 .338 (.54)**
The Locomotive, No. 496, December 15, p. 370.
New **articulated electric trains,** South Indian Railway. (2 500 words & fig.)

Transit Journal. (New York.)

1933 **388 (.73) & 656 .28 (01 (.73)**
Transit Journal, December, p. 437.
STEPHENSON (Ch. A.). — **Transit accident frequency** down 35 per cent in six years. (2 700 words, 3 tables & fig.)

1933 **621 .333 (.73)**
Transit Journal, December, p. 441.
GOULDTHORPE (H. W.) & DELAHOOKE (T. E.). — New York independent **subway motors** have light weight. (1 300 words & fig.)

In Spanish.

Gaceta de los Caminos de hierro. (Madrid.)

1933 **385 (.494)**
Gaceta de los Caminos de hierro, N° 3705, 1 de diciembre, p. 133.
Los **Ferrocarriles Federales suizos** en el año 1932. (2 400 palabras.)

Ingenieria y Construcción. (Madrid.)

1934 **624 .2**
Ingenieria y Construccion, enero, p. 3.
CASADO (C. F.). — **Teoria de las losas continuas sobre columnas.** (3 300 palabras & fig.)

Los Transportes. (Madrid.)

1934 **656 (.460)**
Los Transportes, N° 367, 1 enero, p. 2.
La politica española y el problema de los **transportes.** (1 200 palabras.)

Revista de Obras Publicas. (Madrid.)

1934 **691**
Revista de Obras Públicas, 1° de enero, p. 1.
PARGA-PONDAL (I.) & BAENTSCH (S.). — Sobre un método para el estudio de la **corrosión de los hormigones** por los líquidos agresivos. (3 000 palabras & 11 tablas.)

1934 **625 .5**
Revista de Obras Públicas, n° 2, 15 de enero, p. 21.
OCHOA Y BENJUMEA (J.). — **Funiculares aéreos** para el transporte de personas. (4 400 palabras & fig.)

1934
Revista de Obras Públicas, n° 2, 15 de enero, p. 27
CASADO (C. F.). — Colección de **puentes** de alt estricta. (4 000 palabras & fig.)

1934 **624 .2 & 721**
Revista de Obras Públicas, n° 2, 15 de enero, p. 33
SIERRA (L.). — Cálculo de la armadura mini de las piezas de **hormigón armado** sometidas a flex compuesta. (2 000 palabras & fig.)

In Italian.

Annali dei lavori pubblici. (Roma.)

1933 **625 .1 (.**
Annali dei lavori pubblici, settembre, p. 778.
FIORELLI (J.). — La **nuova ferrovia** della S degna, Sorso-Sassari-Tempio-Palau. (11 600 parole fig.) (Continua.)

1933 **624 & 721**
Annali dei lavori pubblici, settembre, p. 808.
DONATO (L. F.). — Sulla prova a rottura di u **capriata in conglomerato cementizio armato.** (2 parole & fig.)

La tecnica professionale. (Firenze.)

1934 **621 .33 (.4**
La tecnica professionale, N° 1, gennaio, p. 7.
ELENA (S.). — Il sistema di **elettrificazione** ad tato dalle Ferrovie dello stato ungherese. (2 800 role & fig.)

L'Ingegnere. (Roma.)

1934
L'Ingegnere, N° 1, gennaio, p. 2.
COLONNETTI (G.). — Sul **controllo dei ceme** e sul collando delle costruzioni in beton armato. (3 parole.)

1934 **624**
L'Ingegnere, N° 1, gennaio, p. 22.
LETTERIO DONATO (F.). — Sulla posizione d cerniere nelle **travi Gerber.** (500 parole & fig.)

1934 **621**
L'Ingegnere, N° 2, 15 gennaio, p. 76.
SCHLAEPFER (O.). — Il **motore Diesel** nella t zione su rotaie. (2 200 parole & fig.)

Rivista tecnica delle ferrovie italiane. (Roma

1933 **625 .1 (.**
Rivista tecnica delle ferrovie italiane, 15 dicem p. 305.
La ferrovia Fossano-Mondovi-Ceva. (3 300 pa & fig.)

1933 621 .134.1

vista tecnica delle ferrovie italiane, 15 dicembre, p. 327.

DIEGOLI. — I cuscinetti delle bielle nelle locomo-e veloci. Infuenza dello sforzo motore sul lavoro di trito nei cuscinetti. (7 600 parole & fig.)

In Dutch.

De Ingenieur. (Den Haag.)

1934 621 .131.2

Ingenieur, Nr 1, 5 Januari, p. W. 1.

WIDDECKE (K. A. M.). — De mogelijkheden tot rvolmaking van stoomlocomotieven voor zeer snel pende treinen. (6 000 woorden & fig.)

1934 62. (01 & 691

Ingenieur, Nr 1, 5 Januari, p. Bt. 4.

RENGERS (N. J.). — Proefnemingen op kolommen n beton en gewapend beton. (300 woorden, 1 tabel fig.)

1934 624 .2

Ingenieur, Nr 2, 12 Januari, p. B. 4.

KRUYS (F.). — Een amerikaansche methode voor t berekenen van veelvoudig statisch onbepaalde con-ucties. (4 500 woorden & tabels.)

1934 385 (.44)

Ingenieur, Nr 3, 19 Januari, p. V. 1.

GOURSAT. — La modernisation des chemins de fer France. (13 200 woorden, 4 tafereelen & fig.)

Spoor- en Tramwegen. (Utrecht.)

1934 625 .142.2

Spoor- en Tramwegen, No 1, 2 Januari, p. 8.

VAN DER PLOEG (J. A.). — Iets over de houtsoorten welke voor dwarsliggers worden gebruikt. (2 200 woorden & fig.)

In Portuguese

Boletim do Instituto de Engenharia (S. Paulo). (Brasil.)

1933 656 (.81)

Boletim do Instituto de Engenharia, novembro, p. 273.

DIAS DE SANTANNA (F.). — Concorrencia e coordenação dos transportes feitos por via ferrea e de rodagem. (5 600 palavras.)

Gazeta dos caminhos de ferro. (Lisboa.)

1934 656 .1 & 656 .2

Gazeta dos caminhos de ferro, 16 de janeiro, p. 64.

FERREIRA (V.). — Caminhos de ferro e automóveis. (2 400 palavras.) (Contínúa.)

Revista das Estradas de ferro. (Rio de Janeiro.)

1933 656

Revista das Estradas de ferro, No 203, 30 de dezembro, p. 346.

OLIVEIRA (B. M. de). — Concorrencia e coordenação dos transportes feitos por via ferrea e de rodagem. (2 000 palavras.) (Continnúa.)

M. Weissenbruch Co., Ltd., Printer of the King, 49, rue du Poinçon, Bruxelles.

MONTHLY BIBLIOGRAPHY OF RAILWAYS [1].

PUBLISHED UNDER THE SUPERVISION OF

P. GHILAIN,

General Secretary of the Permanent Commission of the International Railway Congress Association.

APRIL 1934

[016. 385. (02]

I. — BOOKS.

In French.

1934 **621 .89**

HAMPSAUR (N.).

Le graissage: théorie, machines, huiles, essais.

Paris, Delagrave. 1 volume, 196 pages et 53 figures. Prix: 30 francs français.)

1934 **621 .335 & 621 .337**

UG (A. M.).

La commande individuelle des essieux.

Zürich et Leipzig, Orel Füssli. 1 volume, 112 pages figures.

1934 **621 .89 & 621 .43**

La technique du graissage rationnel. — Les moteurs Diesel.

Bourg-la-Reine (Seine), Office de Perfectionnements ationnels, 16, avenue Victor Hugo. 1 brochure, 44 ages, 11 planches et figures. (Prix: 20 fr. français.)

1934 **621 .33 (.44)**

L'électrification de la France.

Bordeaux, Sud-Ouest Economique, 6, place Saint-Christoly, et Librairie Delmas. 1 volume. (Prix : 27 fr. rançais.)

1934 **656 .28**

MERCKX (F.).

La prévention des accidents par les méthodes psychologiques.

Bruxelles, Association des Industriels de Belgique our la prévention des accidents du travail, 38, rue de Automne. 1 volume, 155 pages et 8 figures. (Prix: 8 francs belges.)

1934 **665 .882**

PIETTE (M.).

Manuel de la soudure autogène au chalumeau, à l'arc lectrique, oxy-coupage.

Paris (6e), J. B. Baillière & Fils, 19, rue Hautefeuille. volume (11,5 × 16), 134 pages et 216 figures. (Prix : 8 francs français.)

1934 **621 .116 & 621 .114**

PONCHON (R.).

Combustibles liquides et lubrifiants.

Paris (6e), Librairie polytechnique Ch. Béranger. 1 volume (14×19), 1 610 pages, tableaux et 163 figures. (Prix: 140 francs français.)

1934 **697**

SCARSEZ (E.).

Guide pour l'installation des chauffages modernes.

Paris, Librairie polytechnique Ch. Béranger. 1 volume, 306 pages, 9 planches, tableaux et 78 figures. (Prix: 40 francs français.)

1934 **621**

WEISS (E. H.).

Manuel pratique de l'ajusteur-mécanicien.

Paris (7e), Garnier Frères, 6, rue des Saints-Pères. 1 volume (12×18), 248 pages et 180 figures. (Prix: 9 francs français.)

In German.

1934 **656 .235**

ADOLPH (E.).

Eisenbahn-Gütertarifwesen.

Berlin, Verkehrswissenschaftliche Lehrmittelgesellschaft m.b.H. bei der Deutschen Reichsbahn. 1 Band, 166 Seiten. (Preis : 7 R.M. 20.)

1934 **625 .17**

Gleispflege und Oberbauwirtschaft.

Leipzig, Johann Ambrosius Barth und Brüssel, Falk, Fils, 22, rue des Paroissiens. 1 Band, 144 Seiten mit Abbildungen. (Preis : 1.20 R.M.)

1934 **62. (01 & 669**

HEROLD (W.).

Die Wechselfestigkeit metallischer Werkstoffe, ihre Bestimmung und Anwendung.

Leipzig, Johann Ambrosius Barth und Brüssel, Falk, Fils, 22, rue des Paroissiens. 1 Band, 276 Seiten, 165 Textabbildungen und 68 Tabellen. (Preis: 24 R.M.)

(1) The numbers placed over the title of each book are those of the decimal classification proposed by the Railway Congress conjointly with the Office Bibliographique International, of Brussels. (See « Bibliographical Decimal Classification as applied to Railway Science », by L. WEISSENBRUCH, in the number for November 1897, of the *Bulletin of the International Railway Congress*, p. 1509).

1934 **621 .116**

HOLZHAUER (Cl.).

Ermüdungsfestigkeit von Kesselbaustoffen und ihre Beeinflussung durch chemische Einwirkungen.

Berlin, V-D-I-Verlag. 1 Band. (Preis: 6.50 R.M.)

1934 **691 & 721 .9**

Handbuch für Eisenbetonbau.

Leipzig. Johann Ambrosius Barth und Brüssel, Falk, Fils, 22, rue des Paroissiens. 1 Band. (Preis : 5.50 R.M.)

1934 **625 .26 (.43)**

KÜHNE (P.).

Die Bedeutung einer planmässigen Erhaltungswirtschaft beim Fahrzeugpark für die Deutsche Reichsbahn.

Berlin, Verkehrswissenschaftliche Lehrmittelgesellschaft m.b.H. bei der Deutschen Reischsbahn. 1 Band, 56 Seiten und 11 Abbildungen. (Preis: 2 R.M.)

1934 **621 .43**

LANGEN (A.).

Die Diesellokomotive mit unmittelbarem Antrieb.

Leipzig, Johann Ambrosius Barth und Brüssel, Falk, Fils, 22, rue des Paroissiens. 1 Band, 22 Seiten, 67 Abbildungen und 1 Zahlentafeln. (Preis: 5 R.M.)

1934 **624**

MITTASCH (W.) und BRAUNIG (K).

Bau und Berechnung von Brücken.

Leipzig, Johann Ambrosius Barth und Brüssel, Falk, Fils, 22, rue des Paroissiens. 1 Band, 299 Seiten, 650 Abbildungen, 24 Tafeln und 3 Ausschlagtafeln. (Preis: 14 R.M.)

1934 **621 .88**

SCHOENEICH (H.).

Schraubensicherungen.

Berlin, Carl Heymanns. 1 Band. (Preis: 10 R.M.)

1934 **62. (01 & 669**

SCHWARZ (M.).

Röntgenschattenbilder von metallischen Werkstücken und ihre densografische Auswertung.

München und Leipzig, F. u. J. Voglrieder. 1 Band. (Preis: 3 R.M.)

1934 **385 (.436)**

SOLVIS (S.).

Der Weg zur Neuordnung der Oesterreichischen Bundesbahnen.

Wien, Julius Springer. 1 Band, 77 Seiten (Preis: 2.70 R.M.)

1934 **656 .256 & 656 .257**

Stellwerks- und Blockanlagen.

Leipzig, Johann Ambrosius Barth und Brüssel, Falk, Fils, 22, rue des Paroissiens. 1 Band, 165 Seiten und Abbildungen. (Preis: 1.60 R.M.)

In English.

1934 **336 (.73) & 38 (.73)**

Banking and transportation problems. An examination of the « banking system », the monetary policy, and the « transportation system » of the United State with an emphasis on fundamental reforms.

Vol. 171, January 1934, of the Annals of the America Academy of Political and Social Science.

. Philadelphia, Pa. Published by the Association, 34 Walnut Street. (Price: $ 2.00.)

1934 **621 .392 (**

BARDTKE (P.).

Technique of modern welding.

London & Glasgow. Blackie & Son. Ltd. (9×6 1/4× inches), 293 pages. (Price: 15 sh. net.)

1934 **347 .763 (.4**

DENNIS (A. G.) & CORPE (T. D.).

The Road and Rail Traffic Act, 1933.

London E.C. 4. The Solicitor's Law Stationery S ciety Limited, 31, Breams Buildings, Fetter Lan (8 1/2 × 5 1/2 inches), 202 pages, index. (Price: 7 6 d. net.)

1933 **625 .63 & 656**

EDWARDS (Ford K.).

Principles of motor transportation.

New York Published by McGraw-Hill Book Co. I (9 × 5 3/4 inches), 377 pages. illustr. (Price: $ 4.0

1934 **621 .3**

Electric welding. Vol. II, Octobre 1932 to August 19 London, Quasi-Arc Company, Ltd.

1933

LLOYD WILSON (G.).

The transportation crisis.

New York. Published by Holston House, Sears Pu lishing Company, Inc. (8 × 5 1/2 inches), 335 pag (Price : $ 2.50.)

1934 **621 .3 (**

MEARES (J. W.) & NEALE (R. E.).

Electrical engineering practice.

London, W.C. 2. Chapman & Hall, Ltd., 11, Henrie Street. (8 × 6 inches), 920 pages, illust. (Price : 30 net.)

1934 **613 .1, 625 .234 & 6**

MOYER (J. A.) & FILTZ (R. U.).

Air conditioning.

London, McGraw-Hill Publishing Company, L (Price: 24 sh. net.)

1934 **621 .392 (**

Procedure handbook of arc welding. Design and pr tice.

Cleveland, Ohio (U. S. A.). The Lincoln Elect Company. (9 1/4 × 6 × 1 inches), 410 pages. (Pri $ 1.50.)

1934 **385 (02 (.**

Railway Diary and Officials' Directory for 1934.

London, N.W. 1. McCorquodale & Co. Ltd., Carding Street, Euston Square. (9 1/4 × 6 1/4 × 1/2 inch 197 pages. (Price: 3 sh. 6 d.)

1933 385 (08 (.942)
OUTH AUSTRALIAN RAILWAYS.
Annual report of the South Australian Railways ommissioner for the year 1932-33.
Adelaide. Harrison Weir, Government Printer, North errace. 35 pages, tables and a map.

1933 38 (09
T. CLAIR (Labert).
Transportation since time began.
New York. Dodd, Mead & Co. (8 × 5 1/2 inches), 9 pages. (Price: $ 2.50.)

1934 669 .1
HUM (Ernest E.).
The book of stainless steels, corrosion resisting and eat resisting chromium alloys.
Cleveland, Ohio. American Society for Steel Testing. Price: $ 5.00.)

In Spanish.

1934 656 .1 (.460)
IAZ (I. J.).
Transportes por carretera.
Madrid, Säez Hermanos, Martin de los Heros, 65. volumen, 293 páginas.

1934 621 .33
La electrificación desde el punto de vista eco-ómico.
Madrid, Asociación General de Transportes por Vía érrea. 1 volumen, 34 páginas.

1934 621 .392
Manual de soldadura eléctrica por arco.
Madrid, Esab Ibérica, S. A., Abascal. 24 Madrid. 1 vo-umen, 109 páginas y 77 figuras.

1934 621 .13 (.0
Un plan de sustitución de las locomotoras antiguas deficientes.
Madrid, Asociación General de Transportes por Via érrea. 1 volumen, 57 páginas y cuadros.

1934 656 .1 (.3) & 656 .2 (.3)
PESCHAUD (M.).
El problema del ferrocarril y de la carretera en Francia y en los principales países extranjeros.
Madrid. Asociación General de Transportes por Vía Férrea. 1 volumen, 112 páginas.

1934 385
SERRANO (N. P.).
La situación jurídica de los ferrocarriles.
Madrid, Asociación General de Transportes por Vía Férrea. 1 volumen, 37 páginas.

In Italian.

1934 656 .1 & 656 .2
CAPACCIOLI (A.).
Discussioni sulla concorrenza tra ferrovia d'automobile.
Firenze, Stabilimento Grafico Commerciale. 1 volume (17.5 × 25.5), 126 pagine.

1934 721 .9
RIZZOLI (C.).
La tecnica del conglomerato cementizio nelle costruzioni in cemento armato.
Bologna, Edizioni Tecniche Utilitarie. 1 volume (12 × 17), 336 pagine con grafici e tabelle. (Prezzo: 20 Lire.)

In Portuguese.

1933 385. (08 (.68)
Administração dos serviços de Portos e Caminhos de ferro da colónia de Moçambique.
Relatório do ano economico de 1930-31.
Lourenço-Marques. 1 voluma, 468 paginas, mapa e tabelas.

[016. 385. (05]

II. — PERIODICALS.

In French.

Annales des ponts et chaussées. (Paris.)

1934 656 .283 (.44)
Annales des ponts et chaussées, n° 2, 25 janvier, p. 2.
L'accident de Lagny. (1 400 mots.)

Bulletin des transports internationaux par chemins de fer. (Berne.)

1934 385 .63
Bull. des transp. internat. par ch. de fer, janvier. p. 5.
Liste des lignes de chemins de fer et de services automobiles ou de navigation auxquelles s'applique la Convention internationale concernant le transport des marchandises par chemins de fer (C. I. M.) du 23 octobre 1924. (15 000 mots.)

1934 385 .62
Bull. des transp. internat. par ch. de fer, janvier, p. 50.
Liste des lignes de chemins de fer et de services automobiles ou de navigation auxquelles s'applique la Convention internationale concernant le transport des voyageurs et des bagages par chemins de fer (C. I. V.) du 23 octobre 1924. (17 700 mots.)

1934 621 .33 (.485)
Bull. des transp. internat. par ch. de fer, janvier, p. 113.
Electrification des lignes du réseau de l'Etat. (1 500 mots.)

1934 **313 .385 (.485)**
Bull. des transp. internat. par ch. de fer, janvier, p. 121.
Les **Chemins de fer suédois** en 1930 et 1931. (600 mots.)

Bulletin technique de la Suisse romande. (Vevey.)

1934 **656 .254**
Bull. techn. de la Suisse romande, n° 3, 3 février, p. 25.
Appareil automatique de sécurité des trains. (1 700 mots & fig.)

1934 **624 .63**
Bull. techn. de la Suisse romande, n° 4, 17 février, p. 37.
SARRASIN (A.). — **Ponts récents en béton armé.** (800 mots & fig.)

1934 **621 .43 & 656 .222.5**
Bull. techn. de la Suisse romande, n° 4, 17 février, p. 39.
Trains rapides Diesel-électriques. (4 100 mots & fig.)

1934 **691**
Bull. techn. de la Suisse romande, n° 4, 17 février, p. 45.
La protection extérieure des tuyaux métalliques par des **mélanges cimentés.** (1 400 mots.)

Chronique des transports. (Paris.)

1934 **385 .113 (.44)**
Chronique des transports, n° 3, 10 février, p. 6.
Les **dépenses** des grands réseaux de chemins de fer en 1932. (2 500 mots.)

Génie civil. (Paris.)

1934 **669 .1**
Génie civil, n° 2685, 27 janvier, p. 82.
GUILLET (L.). — Les récents progrès de la **cémentation des aciers** par le carbone. (3 000 mots & fig.)

1934 **62. (01 & 721 .4**
Génie civil, n° 2685, 27 janvier, p. 85.
VALLETTE (R.). — Considérations sur les **voûtes** minces autoportantes et leur calcul. (3 800 mots & fig.)

1934 **385 .587**
Génie civil, n° 2685, 27 janvier, p. 88.
FRÉMINVILLE (de). — Les méthodes modernes **d'organisation du travail.** Le taylorisme et le fayolisme; la leçon des Etats-Unis. (3 100 mots.)

1934 **691**
Génie civil, n° 2685, 27 janvier, p. 91.
MARCOTTE (E.). — Valeur comparée des recouvrements employés pour protéger le **béton** pendant sa prise et son durcissement. (1 700 mots.)

1934 **625 .143.1 (.44)**
Génie civil, n° 2685, 27 janvier, p. 93.
Le **nouveau rail,** type S-52, de 62 kg./m., de la Compagnie P. L. M. (900 mots & fig.)

1934 **624 .63 (.6**
Génie civil, n° 2686, 3 février, p. 101.
L'élargissement et le renforcement en **béton.** (1 6 mots & fig.)

1934 **62. (01 & 721**
Génie civil, n° 2686, 3 février, p. 108.
LOSSIER (H.). — La participation des hourdis à résistance des **nervures en béton armé.** (3 800 m & fig.)

1934 **669**
Génie civil, n° 2686, 3 février, p. 114.
Les **aciers semi-inoxydables** Apso et Durapso. Aciéries de Pompey. (500 mots.)

1934 **669 & 6**
Génie civil, n° 2686, 3 février, p. 115.
La **résistance des métaux et alliages** à la tempé ture de l'hydrogène liquide (— 252° 8). (700 m & fig.)

1934 **6**
Génie civil, n° 2687, 10 février, p. 124.
PIGEAUD (G.). — Les **matériaux de construct** non homogènes et non isotropes. (3 800 mots & fig.

1934 **656 .1 (.4**
Génie civil, n° 2687, 10 février, p. 129.
DELANGHE (G.). — Le **nouveau régime fiscal** l'automobile, en France. Comparaison avec les aut pays européens. (5 300 mots.)

1934 **621 .13**
Génie civil, n° 2687, 10 février, p. 134.
Les « **boosters** » de locomotives. (600 mots & fig.)

1934 **62. (01 & 6**
Génie civil, n° 2688, 17 février, p. 149.
PIGEAUD (G.). — Les **matériaux de construct** non homogènes et non isotropes. (4 600 mots & fig.

La Science et la Vie. (Paris.)

1934 **6**
La Science et la Vie, février, p. 111.
REGNAULD (P.). — En **métallurgie,** contrôler c progresser. (4 300 mots & fig.)

L'Économie internationale. (Paris.)

1934 **385**
L'Economie internationale, février, p. 9.
HAY (E.). — Le **régime international** des chem de fer. (1 300 mots.)

Les Chemins de fer et les Tramways. (Pari

1934 **621 .132.5 (.**
Les Chemins de fer et les Tramways, février, p.
Locomotives à vapeur 1-5-0. (2 200 mots & fig.)

1934 **621 .43 (.44)**

s Chemins de fer et les Tramways, février, p. 31.

SPIESS (E.). — **L'automotrice articulée** Renault grande vitesse. (3 900 mots & fig.)

1934 **621 .331 (.44)**

s Chemins de fer et les Tramways, février, p. 33.

VIÉ (G.). — Les **sous-stations** de traction sur les emins de fer français électrifiés. La signalisation mineuse et le bloc automatique lumineux. (4 100 ts & fig.)

1934 **625 .215**

s Chemins de fer et les Tramways, février, p. 37.

Le **freinage magnétique** sur rail. (1 200 mots.)

1934 **625 .215**

s Chemins de fer et les Tramways, février, p. 37.

DESGARDES (E.). — **Bogie** en acier moulé pour tériel à voie de 1 mètre. (2 000 mots & fig.)

1934 **625 .213**

s Chemins de fer et les Tramways, février, p. 40.

Dispositif d'attache de ressort de suspension. (900 ts & fig.)

1934 **656 .259**

s Chemins de fer et les Tramways, février, p. 41.

Dispositifs pour **changements de voie et signaux.** 000 mots & fig.)

1934 **625 .258 & 656 .212.5**

s Chemins de fer et les Tramways, février, p. 44.

Frein de voie à courants de Foucault pour gares de age. (1 800 mots & fig.)

1934 **625 .141**

s Chemins de fer et les Tramways, février, p. 45.

DUCHESNOY. — Emploi éventuel du tarmacadam ur le **ballastage** des voies. (2 900 mots & fig.)

1934 **625 .13 (.44)**

s Chemins de fer et les Tramways, février, p. 48.

CHARRIN (V.). — La **nouvelle percée** des Vosges. 00 mots & fig.)

1934 **625 .13**

s Chemins de fer et les Tramways, février, p. 49.

Difficultés dans le creusement des **tunnels.** (500 mots fig.)

1934 **691 & 625 .13**

s Chemins de fer et les Tramways, février, p. 50.

Un nouveau **ciment** pour **tunnels** de voies ferrées. 00 mots.)

Industrie des voies ferrées et des transports automobiles. (Paris.)

1933 **625 .143.1**

ndus. des voies ferrées et des transp. autom., décembre, p. 114.

WOHNLICH (A.). — Les **rails à ornière** et leurs perfectionnements. (17 000 mots & fig.)

1933 **625 .151 & 625 .62**

L'Indus. des voies ferrées et des transp. autom., décembre, p. 147.

FISCHER (L.). — Les **aiguillages** à lames flexibles pour les réseaux de tramways. (6 000 mots & fig.)

1934 **625 .143.3 (.44) & 625 .62 (.44)**

L'Indus. des voies ferrées et des transp. autom., janvier, p. 157.

BRANT (J.) & BARRAUD (P.). — **Résultats** obtenus sur les Réseaux de Nantes et Bordeaux par l'emploi d'une voiture raboteuse, pour la lutte contre l'**usure ondulatoire.** (5 000 mots & fig.)

1934 **625 .62 & 665 .882**

L'Indus. des voies ferrées et des transp. autom., janvier, p. 169.

LEBRUN (M.). — L'emploi de la **soudure autogène** dans les exploitations de tramways. (2 800 mots & fig.)

L'Ossature métallique. (Bruxelles.)

1934 **624 .92**

L'Ossature métallique, janvier, p. 11.

BRYLA (S.). — Les **charpentes métalliques tubulaires.** (2 400 mots & fig.)

1934 **625 .23 (.493)**

L'Ossature métallique, janvier, p. 34.

Les **voitures métalliques** sur les réseaux des Chemins de fer belges. (1 900 mots & fig.)

Revue générale des chemins de fer. (Paris.)

1934 **621 .132.5 (.44)**

Revue générale des chemins de fer, février, p. 109.

PARMANTIER (A.). — Les nouvelles **locomotives à marchandises,** type 1-5-1 (série 151-A) de 3 000 chevaux au crochet de traction du tender, des Chemins de fer de Paris-Lyon-Méditerranée. (6 000 mots & fig.)

1934 **656 .212.5 (.44)**

Revue générale des chemins de fer, février, p. 128.

LEVI (R.) & BOILLOT. — **Transformation et modernisation des aménagements** de Trappes-Triage. (10 000 mots & fig.)

1934 **621 .13 (.44), 621 .335 (.44) & 625 .2 (.44)**

Revue générale des chemins de fer, février, p. 147.

Améliorations apportées au **matériel roulant** depuis la guerre par les Grands Réseaux français. (16 000 mots & fig.)

1934 **385 .113 (.45)**

Revue générale des chemins de fer, février, p. 189.

Les **Chemins de fer de l'Etat italien** pendant la première décade du fascisme 1922-1932. (6 300 mots.)

1934 **385. (09 (.593)**

Revue générale des chemins de fer, février, p. 198.

Les **Chemins de fer du Siam.** (3 600 mots & fig.)

1934 **625 .245 & 656 .1**

Revue générale des chemins de fer, février, p. 208.

Le **transport sans transbordement** par le rail et par la route. (1 900 mots & fig.)

Revue universelle des Mines. (Liége.)

1934 **624 .2**

Revue universelle des mines, n° 3, 1er février, p. 61; n° 4, 15 février, p. 91.

MULS (F.). — Etude de la **flexion** des pièces droites sollicitées au delà de la limite élastique. (7 300 mots & fig.)

Société des Ingénieurs civils de France. (Paris.)

1934 **33**

Soc. des Ing. civ. de France, P.V. de la séance du 26 janvier, p. 52.

CHEVALIER (J.). — Le **chômage.** (7 000 mots.)

In German.

Die Lokomotive. (Wien).

1934 **621 .132.3 (.492) & 621 .132.6 (.492)**

Die Lokomotive, Heft 1, Jänuar, S. 1.

DORTMUND (F. S.). — Die schwerste **Tenderlokomotive** der Welt. (800 Wörter & Abb.)

1934 **621 .335 & 621 .43**

Die Lokomotive, Heft 1, Jänuar, S. 3.

FREIBERG (D.). — **Dieselelektrische Schnellbahnzüge** in Stromlinienbauart. (2 800 Wörter & Abb.)

1934 **621 .132.3 (.42)**

Die Lokomotive, Heft 2, Februar, S. 21.

2 C 1 — **Vierzylinder-Heissdampf-Schnellzugslokomotive** der London Midland und Scottish Railway. (1 400 Wörter & Abb.)

1934 **621 .132.8 (.65)**

Die Lokomotive, Heft 2, Februar, S. 23.

Garrat-Pacific-Schnellzugslokomotive für das algerische Netz der P. L. M. (1 400 Wörter & Abb.)

1934 **621 .134.4 (.44)**

Die Lokomotive, Heft 2, Februar, S. 32.

Geschichte der **Verbundlokomotiven** der P. L. M. (3 000 Wörter & Abb.) (Fortsetzung folgt.)

Elektrische Bahnen. (Berlin.)

1934 **621 .33 (.43)**

Elektrische Bahnen, Januar, S. 1.

WECHMANN (W.). — Der **elektrische Zugbetrieb** der Deutschen Reichsbahn während der Jahre 1932 und 1933. (8 200 Wörter & Abb.)

1934 **621 .33 (.494)**

Elektrische Bahnen, Januar, S. 20.

DÜRLER (W.). — Zehn Jahre voller **elektrischer Betrieb** der Rhätischen Bahn. (1 500 Wörter & Abb.)

1934 **621 .33 (.436)**

Elektrische Bahnen, Januar, S. 23.

KAAN (E. R.). — Eröffnung des **elektrischen Betriebes** auf der Nordrampe der Tauernbahn. (600 Wörter.)

Glasers Annalen. (Berlin.)

1934 **625 .215 & 625 .6**

Glasers Annalen, Heft 2, 15. Januar, S. 9.

VON LENGERKE. — **Kurvenbewegliche Fahrzeug** für Strassenbahnen. (3 500 Wörter & Abb.)

Organ für die Fortschritte des Eisenbahnwesen (Berlin.)

1934 **656 .22**

Organ für die Fortschritte des Eisenbahnwesens, Heft 1. Februar, S. 41.

MÜLLER (W.). — Betriebstechnische Untersuchungen der **freien Strecke.** (11 300 Wörter, 3 Tafeln & Abb.)

1934 **656 .2**

Organ für die Fortschritte des Eisenbahnwesens, Heft S. 57.

HARTWIG. — Zweiseitig ausschwenkbares Warnkreuz für **Eisenbahnwegübergänge** (600 Wörter & Abb.)

1934 **656 .2**

Organ für die Fortschritte des Eisenbahnwesens, Heft S. 58.

Das moderne Sicherungswesen der Reichsbahn. (1 1 Wörter & Abb.)

Zeitschrift des Vereines Deutscher Ingenieure (Berlin.)

1934 **385 .56 (.4**

Zeitsch. des Ver. deutsch. Ing., Nr. 4. 27. Januar. S. 1

LEIBBRAND (M.). — **Reichsbahn und Arbeitsb schaffung.** (5 000 Wörter.)

1934 **6**

Zeitsch. des Ver. deutsch. Ing., Nr. 5, 3 Februar, S. 1

JIPP (A.). — Die wirtschaftliche Neugestaltung d **Telegraphie.** (3 000 Wörter & Abb.)

1934 **625 .2**

Zeitsch. des Ver. deutsch. Ing., Nr. 5, 3 Februar. S. 1

VOGELPOHL (G.). — **Windkanalversuche** über d **Luftwiderstand** von Eisenbahn-Fahrzeugen. (6 600 Wö ter & Abb.)

1934 **62. (01, 669 & 6**

Zeitsch. des Ver. deutsch. Ing., Nr. 6, 10. Februar, S. 1

BERTHOLD (R.). — Stand und Entwicklung d zerstörungsfreien **Werkstoffprüfung.** (5 400 Wörter Abb.)

1934 **62. (**

Zeitsch. des Ver. deutsch. Ing., Nr. 6, 10. Februar, S. 1

KÖRBER (Fr.). — **Werkstoffprüfung** und Erfahru (5 000 Wörter.)

1934 **624 .3 (.4**

Zeitsch. des Ver. deutsch. Ing., Nr. 7, 17. Februar. S. 2

Die **Elbebrücke** bei Tangermünde. (1 500 Wörter Abb.)

1934 **669**

Zeitsch. des Ver. deutsch. Ing., Nr. 6, 10. Februar, S. 220.

RÖNIGEN (P.) & DONIKE (W.). — Über das Warmverformungsvermögen binärer und komplexer **Kupfer-Zink-Legierungen.** (3 600 Wörter & Abb.)

Zeitschrift für das gesamte Eisenbahn-Sicherungswesen. (Berlin.)

1934 **656 .257**

Zeitsch. für das gesamte Eisenb.-Sicherungsw., Nr. 2, 1. Februar, S. 13.

WAGNER (Th.). — Das **Mehrreihenstellwerk.** (3 400 Wörter & Abb.)

Zeitung des Vereins mitteleuropäischer Eisenbahnverwaltungen. (Berlin.)

1934 **656 .254 (.43)**

Zeitung des Vereinsmitteleurop. Eisenbahnverw. Nr. 4, 25. Januar, S. 77.

KRAUSSKOPF. — Das moderne **Sicherungswesen** der Reichsbahn. Einzelheiten über die elektromagnetische (induktive) Zugbeeinflussung. (1 600 Wörter & Abb.)

1934 **313 : 625 .26**

Zeitung des Vereinsmitteleurop. Eisenbahnverw. Nr. 4, 25. Januar, S. 82.

Zur Auswertung der **Eisenbahnstatistik** insbesondere für die **Fahrzeugunterhaltung.** (6 000 Wörter & Abb.)

1934 **656 .222.5 (.43)**

Zeitung des Vereinsmitteleurop. Eisenbahnverw. Nr. 5, 1. Februar, S. 93.

REMY. — Reichsbahn und gross-städtischer **Nahverkehr.** (6 500 Wörter, 4 Tafeln & Abb.)

1934 **656 .212.6 (.43)**

Zeitung des Vereinsmitteleurop. Eisenbahnverw. Nr. 6, 8. Februar, S. 113.

RICHARD. — Der **Ilo-Einrad-Wagenschieber.** Ein auf einer Schiene laufendes Schubgerät für Eisenbahnwagen. (2 000 Wörter & Abb.)

1934 **385. (01 (.5)**

Zeitung des Vereinsmitteleurop. Eisenbahnverw. Nr. 6, 8. Februar, S. 117.

DIECKMANN. — Die früheren und jetzigen **Bagdadbahnpläne.** (1 400 Wörter & Abb.)

1934 **656**

Zeitung des Vereinsmitteleurop. Eisenbahnverw. Nr. 6, 8 Februar, S. 119.

BAUER. — Neuzeitliche **Werbemittel für Sonderzüge.** (700 Wörter & Abb.)

1934 **621 .132.8 (.43)**

Zeitung des Vereinsmitteleurop. Eisenbahnverw. Nr. 7, 15. Februar, S. 133.

PONTANI. — Gedanken zur **Treibstoffversorgung** im L.K.W. betriebe der Reichsbahn. (2 800 Wörter & Abb.)

1934 **656 .231 (.43)**

Zeitung des Vereinsmitteleurop. Eisenbahnverw. Nr. 7, 15. Februar, S. 137.

Die **Entfernungstarife** für den deutschen Reichsbahn-Personen-Gepäck- und Expressgutverkehr. (3 700 Wörter.)

In English.

Annals, American Academy of Political and Social Science. (Philadelphia).

1934 **385 (.73)**

Annals, Amer. Acad. Polit. and Social Science, January, p. 155.

PARMELEE (J. H.). — **The recent past and immediate future of the railways.** (2 500 words.)

1934 **385 (.73) & 656 .2 (.73)**

Annals, Amer. Acad. Polit. and Social Science, January, p. 160.

LEE (E.). — **Railroad operation and services.** (3 800 words.)

1934 **385 .15 (.73)**

Annals, Amer. Acad. Polit. and Social Science, January, p. 166.)

ATTERBURY (W. W.). — **Railroad consolidation.** (3 800 words.)

1934 **385 .1 (.73)**

Annals, Amer. Acad. Polit. and Social Science, January, p. 172.

LEWIS (E. I.). — **Railroad valuation.** (4 300 words.)

1934 **385 .15 (.73)**

Annals, Amer. Acad. Polit. and Social Science, January, p. 180.

JOHNSON (E. R.). — Problems of **government ownership and operation of railroads.** (2 800 words.)

1934 **656 .231 (.73)**

Annals, Amer. Acad. Polit. and Social Science, January, p. 185.

HADEN ALLDREDGE (J.). — **Railroad mileage freight rates.** (4 000 words.)

1934 **386 (.73)**

Annals, Amer. Acad. Polit. and Social Science, January, p. 244.

DUNCAN (C. S.). — Revenue for **highway construction and maintenance.** (2 900 words, tables & fig.)

1934 **347 .763 (.73) & 386 (.73)**

Annals, Amer. Acad. Polit. and Social Science, January, p. 253.

KUHN (J. P.). — **Constructive governmental supervision of motor transport.** (5 900 words.)

1934 **347 .763 (.73) & 656 .1 (.73)**

Annals, Amer. Acad. Polit. and Social Science, January, p. 263.

ELDER (A. H.). — Government regulation of **railroad competitors.** (2 800 words.)

Brotherhood of Locomotive Firemen and Engimen's Magazine. (Cleveland, Ohio.)

1934 **625 .25 & 656 .222.1**

Brotherhood of Loc. Firemen and Enginemen's Magazine, January, p. 47.

SILLCOX (L. K.). — **High speed railway service** — its problems and perplexities. (2 600 words & fig.)

Bulletin, American Railway Engineering Association. (Chicago, Ill.)

1933 **347 .75 (.73)**

Bull., Amer. Ry. Engineering Asson, October, p. 309.

Report of Committee XX — Uniform general contract forms. — Form of agreement for the purchase of electrical energy in large volume (such as required for traction purposes).

Form of conveyance of title granting the right to construct and maintain buildings over railway property.

Form of agreement for pipe line crossings under railway tracks.

Form of agreement for use of railway property by pipe lines paralleling railway, with social reference to pipe lines carrying high pressure inflammable oils and gas.

Form of agreement with public authorities for highway grade crossing elimination or separation (11 000 words & fig.)

1933 **656 .25 (.73)**

Bull., Amer. Ry. Engineering Asson, October, p. 333.

Report of Committee on signals and interlocking. Developments of **automatic train control.** Increased efficiency secured in operation by signal indication, including remote control of switches, and centralized traffic control, in lieu of train orders and time table superiorities. Synopsis of the principal current activities of the signal section, A. R. A., supplemented with list and references by number of adopted specifications, designs and principles of signaling practice. (2 900 words & fig.)

1933 **621 .3 (.73)**

Bull., Amer. Ry. Engineering Asson, October, p. 343.

Report of Committee on electricity. Synopsis of reports of the Electrical Section. (1 100 words.)

1933 **625 .122 (.73)**

Bull. Amer. Ry. Engineering Asson, October, p. 347.

Report of Committee on roadway. — Roadbed drainage. Jacking culvert pipe through fills. Bearing power and other physical properties of soils, including effect upon roadbed. Methods of protection against drifting snow and opening snow blockades. Methods of protection against drifting sand. (24 000 words & fig.)

1933 **621 .138 (.73) & 625 .26 (.73)**

Bull., Amer. Ry. Engineering Asson, October, p. 403.

Report of Committee on shops and locomotive terminals. — Turntables. Power plants. Wheel-removing equipment for engine houses. Car paint shops. (5 200 words & fig.)

1933 **656 .21 (.73) & 725 .3 (.73)**

Bull., Amer. Ry. Engineering Asson, November, p. 419.

Report of Committee on yards and terminals. Proposed revision of rules for the location, maintenance, operation and testing of railway track scales. Grain elevator storage yards and plant tracks. Hump yards. Scales used in railway service. Proposed manufacture and installation of motor truck, built-in, self-contained and portable scales for railway service. Expediting of freight car movements through yards. (22 000 words & fig.)

1933 **625 .144.4 (.73) & 625 .17 (.73)**

Bull., Amer. Ry. Engineering Asson, November, p. 475.

Report of Committee on maintenance of way work equipment. Adaptability of air and electric driven tools in maintenance of way work. Snow melting devices. Use and adaptability of track type tractors. Use of weed destroying equipment. Track welding equipment (a) oxy-acetylene; (b) electric arc. Hazards of spray painting. Organization for use and maintenance of ballast cleaning machines. (14 500 words & fig.)

1933 **725 .3 (.73)**

Bull., Amer. Ry. Engineering Asson, November, p. 529.

Report of Committee on buildings. Revised specifications for built-up roofing. Specifications for railway buildings. Relative merits of wood and fireproof roof structures. Causes of dust explosions in grain elevators and methods of obviating the hazard. (15 000 words & fig.)

1933 **625 .162 (.73) & 725 .3 (.73)**

Bull., Amer. Ry. Engineering Asson, November, p. 561.

Report of Committee on grade crossings. Specifications for street crossings over railway tracks, both steam and electric. Relative economy of different types of highway grade crossings. Proper vertical curves on highways for grade separation projects. Merits and economy in use of « stop and go » signal. (7 000 words.)

Engineer. (London.)

1934 **651**

Engineer, No. 4072, January 26, p. 101.

The Hollerith tabulator. (6 500 words & fig.)

1934 **621 .43 (.42)**

Engineer, No. 4072, January 26, p. 105.

Oil locomotives for L. M. and S. Railway. (800 words & fig.)

1934 **621 .31 (.42)**

Engineer, No. 4073, February 2, p. 115.

The new Barking **power station.** (6 000 words & fig.)

1934 **621 .133.3 & 621 .392**

Engineer, No. 4073, February 2, p. 122.

Welded boiler drums and steam receivers. (1 200 words.)

1934 **621 .116**

Engineer, No. 4073, February 2, p. 125.

Automatic combustion control. (2 000 words.)

1934 621 .116
gineer, No. 4073, February 2, p. 128.
Automatic train control. (1 300 words.)

1934 621 .43 (.43)
gineer, No. 4073, February 2, p. 128.
German high-speed **oil engines for railcars.** (3 200 words & fig.)

1934 621 .116
gineer, No. 4073, February 2, p. 132.
HODGSON (J. L.) & ROBINSON (L. L.). — **Auto-tic combustion control for boilers.** (3 800 words fig.)

Engineering. (London.)

1934 621 .133.1
gineering, No. 3548, January 12, p. 29.
FOXWELL (G. E.). — The **combustion of pulveris- fuel.** (3 000 words.)

1934 656 .212.6 & 656 .213
gineering, No. 3548, January 12, p. 48.
Phosphate-loading plants at Nauru and Ocean and. (2 000 words & fig.)

1934 62. (01 & 669 .1
gineering, No. 3548, January 12, p. 50.
HURST (J. E.). — Some experiments on the **resist-ce to wear of nitrogen-hardened cast iron.** (2 600 rds. 6 tables & fig.)

1934 625 .13 (.42)
gineering, No. 3549, January 19, p. 55.
The Mersey **road tunnel.** (5 700 words & fig.)

1934 62. (01 & 693
gineering, No. 3549, January 19, p. 58.
JAKEMAN (C.). — The testing of **steam pipe heat ulating materials.** Application of tests results to actice. (2 300 words. 3 tables & fig.)

1934 621 .335 & 621 .43
gineering, No. 3549, January 19, p. 63.
Constant-power control for oil-electric locomotives. 000 words.)

1934 621 .133.4 & 621 .133.5
gineering, No. 3549, January 19, p. 69.
Locomotive **smoke-box conditions.** (2 300 words.)

1934 621 .132.3 (.42)
gineering, No. 3549, January 19, p. 76.
-6-o type locomotives on the London Midland and ottish Railway. (500 words & fig.)

1934 621 .165 (.73)
gineering, No. 3549, January 19, p. 78.
CARTER (W. A.) & ELLENWOOD (F. O.). — The rmal performance of the Detroit **turbine using am at 1 coo deg. Fahr.** (4 200 words, tables & fig.)

1934 016
Engineering, No. 3550, January 26, p. 85.
BRADFORD (S. C.). — **Sources of information on specific subjects.** (2 600 words, 1 table & fig.)

1934 625 .13 & 625 .4
Engineering, No. 3550, January 26, p. 92.
75-in. Aeroto fan tube railway ventilation. (1 300 words & fig.)

1934 621 .132.5 (.51)
Engineering, No. 3550, January 26, p. 102.
4-8-o type locomotives for the Hangchow-Kiangshan Railway. (400 words & fig.)

1934 625 .111 (.42)
Engineering, No. 3550, January 26, p. 104.
Greenisland loop line; L. M. S. Northern Counties Committee. (1 000 words & fig.)

1934 62. (01 & 621 .392
Engineering, No. 3551, February 2, p. 112.
ROBERTS (A. M.). — Simple **tests for arc-welded joints.** (4 400 words, 4 tables & fig.)

1934 624 .2
Engineering, No. 3551, February 2, p. 118.
Hammer-blow and moving-load stresses on railway-bridges. Abstracts of papers read before the Institution of Civil Engineers, January 23, 1934. — **Hammer-blow impact on the main girders of railway-bridges,** by R. W. FOXLEE & E. H. GREET. — **Moving-load stresses in short-span railway-bridges,** by W. E. GELSON. (1 600 words.)

1934 621 .116
Engineering, No. 3551, February 2, p. 129.
HODGSON (J. L.) & ROBINSON (L. L.). — Development of **automatic ocmbustion control systems** for industrial and power station boilers.
Paper read at the Institution of Mechanical Engineers, January 26, 1934. (2 600 words & fig.)

1934 621 .116
Engineering, No. 3551, February 2, p. 134.
HODGSON (J. L.) & ROBINSON (L. L.). — **Combustion control systems.** (5 500 words & fig.). Paper read before the Institution of Mechanical Engineers, 26 January 1934. Abridged.

Engineering News-Record. (New York.)

1934 624 .8 (.52)
Engineering News-Record, No. 1, January 4, p. 9.
Welded lift bridge built in Japan, **with trusses of Vierendeel type.** (500 words & fig.)

1934 693 & 721 .3
Engineering News-Record, No. 1, January 4, p. 12.
LYSE (I.). — **Reinforced-brick columns.** (600 words, 1 table & fig.)

1934 624 .63 (.494)
Engineering News-Record, No. 2, January 11, p. 44.
KETCHUM (M. S.). — **Thin-section concrete arches** as built in Switzerland. (700 words & fig.)

Great Western Railway Magazine. (London.)

1934 **725 .31 (.42)**
Great Western Ry. Magazine, February, p. 65.
CULVERHOUSE (P. E.). — The alterations at Paddington Station. — Part IV: the new **buildings.** (2 800 words & fig.)

Indian Railway Gazette. (Calcutta.)

1934 **621 .133.7**
Indian Railway Gazette, January, p. 10.
Water softening for locomotives. (700 words & fig.)

1934 **621 .31**
Indian Railway Gazette, January, p. 12.
Selection of material for the transmission of power. (2 200 words.)

Journal, Institution of Engineers, Australia. (Sydney.)

1933 **621 .132.4 (.94)**
Journal, Institut. of Engineers, Australia, December, p. 357.
MILLS (F.). — **The railway locomotive problem** in Western Australia. (6 000 words & fig.)

1933 **691 & 693**
Journal, Institut. of Engineers, Australia, December, p. 419.
INGHAM (the late L.). — **The bulking of sand.** (3 800 words & fig.)

1933 **624 .1, 625 .12 & 721 .1**
Journal, Institut. of Engineers, Australia, December, p. 425.
DARWIN (D. V.). — **Earth** as a structural material with particular reference to **road construction.** (3 500 words & fig.)

Journal, Institute of Transport. (London.)

1934 **38 & 62**
Journal, Institute of Transport, February, p. 175.
INGLIS (R. J. M.). — **The engineer in transport.** (17 000 words.)

1934 **347 .763 & 656 .1**
Journal, Institute of Transport, February, p. 192.
ALDINGTON (H. E.). — Modern methods of **road traffic control.** (9 000 words.)

1934 **347 .763 (.42) & 351 .81 (.42)**
Journal, Institute of Transport, February, p. 200.
MILLER (H. T. G.). — **The socialization of transport.** (5 700 words.)

Journal, Permanent Way Institution. (London.)

1933 **625 .4 (.42)**
Journal, Perm. Way Institut., December, p. 245.
BOX (W. L.). — **The Liverpool Overhead Railway.** (7 400 words & 1 map.)

1933 **625 .14 (.42 + .73) & 625 .17 (.42 + .73**
Journal, Perm. Way Institut., December, p. 262.
TRATMAN (E. E. R.). — **American railway trac**
(4 800 words.)

1933 **625 .14 & 625 .1**
Journal, Perm. Way Institut., December, p. 274.
DAWSON (J. B.). — **Permanent way** and t
future. (2 700 words & fig.)

1933 **625 .13 & 625 .1**
Journal, Perm. Way Institut., December, p. 284.
CRISP (J. A.). — **Maintenance of underli**
structures. (4 500 words & fig.)

1933 **625 .**
Journal, Perm. Way Institut., December, p. 296.
GOUGH (L.). — **Duties of a permanent way inspe**
tor. (2 400 words.)

1933 **621 .33 & 625 .**
Journal, Perm. Way Institut., December, p. 302.
KNOTTS (R. G.). — **Maintenance of electric tra**
equipment and safety working. (5 300 words.)

Modern Transport. (London.)

1934 **656 .25 (0 (.4**
Modern Transport, No. 773, January 6, p. 3.
LASCELLES (T. S.). — **Signalling** on French Ra
ways. (2 200 words & 1 table.)

1934 **621 .335 (.73) & 621 .43 (.7**
Modern Transport, No. 773, January 6, p. 4.
Stainless steel train for U. S. A. — Petrol-elect
engines. (1 000 words & fig.)

1934 **621**
Modern Transport, No. 773, January 6, p. 5.
RYAN (M. F.). — **Internal combustion:** the eng
of the future. (2 400 words.)

1934 **621 .43 (.4**
Modern Transport, No. 773, January 6, p. 6.
Another L. M. S. **Diesel locomotive.** (1 100 wo
& fig.)

1934 **385. (091 (.**
Modern Transport, No. 773, January 6, p. 7.
Railways of China and Manchuria. Difficulties
owing civil wars. (2 800 words.)

1934 **347 .763 (.42) & 656 .1 (.**
Modern Transport, No. 773, January 6, p. 8.
Railways and road transport. Probable future pol
(1 000 words.)

1934 **625 .212 (.**
Modern Transport, No. 773, January 6, p. 9.
Road-rail transport. — **Rubber-tyred railcar.** (
words & fig.)

1934 **621 .33 (.43)**
ɔdern Transport, No. 774, January 13, p. 4.
Experiment in **railway electrification.** — New trac-n system. (1 100 words & fig.)

1934 **621 .132.5 (.42)**
ɔdern Transport, No. 774, January 13, p. 6.
New locomotives for L. M. S. express goods services. **ro-cylinder 2-6-0 superheated tender engines.** (1 600 rds & fig.)

1934 **656 .212.6 & 656 .213**
ɔdern Transport, No. 774, January 13, p. 7.
BENTHAM (C.). — **Handling of phosphate rock.** 400 words & fig.)

1934 **625 .245 (.42)**
ɔdern Transport, No. 774, January 13, p. 9.
A **convertible rail wagon.** (700 words & fig.)

1934 **621 .43 (.42)**
ɔdern Transport, No. 774, January 13, p. 9.
L. N. E. R. **streamlined railbus.** — Results in service. 00 words & fig.)

1934 **656 .251**
ɔdern Transport, No. 775, January 20, p. 3.
TATTERSALL (A. E.). — **Colour-light signals.** — chnical and operating advantages. (2 600 words.)

1934 **656 .23 & 659**
ɔdern Transport, No. 775, January 20, p. 7.
PAYNE (H. W.). — **Attracting goods traffic** to e railways. — Review of recent progress. (2 000 rds.)

1934 **621 .132.5 (.51)**
ɔdern Transport, No. 775, January 20, p. 9.
British-built locomotives for China. — **Six 4-8-0 type gines** for Hangchow-Kiangshan Railway. (700 words fig.)

1934 **347 .763 (.42) & 656 .1 (.42)**
ɔdern Transport, No. 776, January 27, p. 3.
ROBINSON (A. T. V.). — **Licensing of road pas-nger services.** — Outstanding problems and their lution. (3 600 words.)

1934 **621 .132.8 (.47)**
ɔdern Transport, No. 776, January 27, p. 5.
Experimental condensing locomotive for U. S. S. R. nverted 0-5-0 type goods engine for service on the ntral Asia Railway. (1 700 words & fig.)

1934 **385 .114 (.68) & 656 .1 (.68)**
ɔdern Transport, No. 776, January 27, p. 6.
Rail and road costs compared. — Four times eaper by rail. (1 200 words.)

1934 **621 .43 (.54)**
ɔdern Transport, No. 777, February 3, p. 3.
Petrol-driven railcars for India. British-built units r Junagad State Railway. (1 400 words & fig.)

1934 **625 .175 (.42)**
Modern Transport, No. 777, February 3, p. 5.
« **Road-rail freighter** » for railway maintenance. (1 200 words & fig.)

Oil Engine. (London.)

1934 **621 .43 (.42)**
Oil Engine, January, p. 268.
The performance of the English Electric **railcar.** (1 200 words & fig.)

1934 **621 .43 (.43)**
Oil Engine, January, p. 271.
HEDLEY (R.). — Germany's latest **railcar** design. (600 words & fig.)

1934 **621 .43 (.42)**
Oil Engine, January, p. 273.
The first of eight new **locomotives** for the L. M. S. R. (900 words & fig.)

Proceedings, Institution of Mechanical Engineers. (London.)

1933 **621**
Proceed., Institut. of Mech. Engineers, Vol. 125, p. 143.
POLLARD (A. F. C.). — **Kinematic design in engineering.** (2 300 words & fig.)

1933 **536**
Proceed., Institut. of Mech. Engineers, Vol. 125, p. 201.
ROBEY (E. W.) & HARLOW (W. F.). — Heat liberation and transmission in **large steam-generating plants.** (40 000 words & fig.)

Railway Age. (New York.)

1933 **625 .244 (.493)**
Railway Age, No. 27, December 30, p. 903.
Belgian **refrigerator car** is mechanically cooled. (1 400 words & fig.)

1933 **656 .256.3 (.73)**
Railway Age, No. 27, December 30, p. 905.
Automatic interlocking on the Alton & Southern. (1 200 words & fig.)

1933 **625 .173**
Railway Age, No. 27, December 30, p. 909.
BALDRIDGE (C. W.). — The basis of a **rail relay** program. (1 700 words & fig.)

1933 **625 .234 & 625 .244**
Railway Age, No. 27, December 30, p. 913.
SAHLMANN (F. L.). — The **air conditioning** problem. (3 700 words.)

1934 **621 .43 (.73)**
Railway Age, No. 1, January 6, p. 5.
Busch-Sulzer develops **locomotive Diesel engine** (2 600 words & fig.)

1934 **656 .211.4 (.73)**
Railway Age, No. 1, January 6, p. 13.
Propose new **passenger terminal** for Chicago. (1 900 words & fig.)

1934 **625 .111 (.73)**
Railway Age, No. 2, January 13, p. 34.
Old **tunnel demolished** and **grades separated** under traffic. (2 800 words & fig.)

1934 **621 .132.5 (.43) & 621 .133.3 (.43)**
Railway Age, No. 2, January 13, p. 39.
German State Railways build **alloy-steel boilers.** — Chrome-molybdenum and copper-manganese alloys are used on 4-6-2 locomotives carrying 368 lb. pressure. (700 words, 1 table & fig.)

1934 **625 .151 (.73)**
Railway Age, No. 2, January 13, p. 43.
Spring switches on the St. Louis — San Francisco. (1 200 words & fig.)

1934 **656 .211 (.73) & 725 .31 (.73)**
Railway Age, No. 3, January 20, p. 66.
Railway facilities modernized at Hamilton, Ont. (4 000 words & fig.)

1934 **621 .132.8 (.65)**
Railway Age. No. 3, January 20, p. 73.
A high-speed articulated locomotive. (1 600 words & fig.)

1934 **656 .261 (.73)**
Railway Age, No. 3, January 20, p. 79.
Increasing acceptance of **storedoor service.** (1 300 words & fig.)

Railway Engineer. (London.)

1934 **621 .9 & 669 .1**
Railway Engineer, February, p. 38.
Removing rust from steel structures. (1 200 words & fig.)

1934 **625 .216 (.44)**
Railway Engineer, February, p. 40.
Automatic couplers on French Railways. (1 300 words & fig.)

1934 **621 .132.3 (.62)**
Railway Engineer, February, p. 42.
Rebuilt Egyptian **Express locomotives.** (500 words & fig.)

1934 **624. (0**
Railway Engineer, February, p. 43.
Aluminium alloy in bridge construction. (800 words.)

1934 **621 .132.5 (.73)**
Railway Engineer, February, p. 44.
POULTNEY (E. C.). — **Fast freight locomotives,** Lehigh Valley Railroad. (4 300 words & fig.)

1934 **625 .2**
Railway Engineer, February, p. 50.
New Liechty **bogies for high speeds.** (1 100 wor & fig.)

1934 **625 .172 (.7**
Railway Engineer, February, p. 52.
A **gyrostatic track recording car** (Sperry). (1 7 words & fig.)

1934 **621 .131**
Railway Engineer. February, p. 54.
LOMONOSSOFF (G.). — **Adhesion.** (2 300 wor & fig.)

1934 **621 .132.3 (.42) & 621 .132.5 (.4**
Railway Engineer, February, p. 58.
New L. M. S. R. **2-6-0 mixed traffic locomotive** (1 000 words & fig.)

1934 **625 .143**
Railway Engineer, February, p. 61.
Fish bolts and the screwing test. (2 800 words & fig

Railway Engineering and Maintenance. (New York.)

1934 **625 .123 (.7**
Railway Engineering and Maintenance, January, p.
Drainage system overcomes serious slides (1 8 words & fig.)

1934 **656 .211**
Railway Engineering and Maintenance, January, p.
Long **platforms repaved** under difficulties. (1 7 words & fig.)

1934 **621 .93 (.73) & 625 .144.4 (.7**
Railway Engineering and Maintenance, January, p. 2
Modern equipment speeds **rail sawing.** (3 200 wor & fig.)

1934 **625 .143**
Railway Engineering and Maintenance, January, p. 2
Why **spring washers** are used. (1 900 words & fig

Railway Gazette. (London.)

1934 **656 .257 (.4**
Railway Gazette, No. 2, January 12, p. 45.
Re-signalling of York-Northallerton main line, L. E. Ry. (3 200 words & fig.)

1934 **621 .132.3 (.42) & 621 .132.5 (.4**
Railway Gazette, No. 2, January 12, p. 53.
New **2-6-0 mixed traffic locomotives,** L. M. S. R (1 200 words & fig.)

1934 **621 .135.1 & 621 .1**
Railway Gazette, No. 2, January 12, p. 54.
A clear **engine cab outlook.** (1 000 words & fig.)

1934 625 .1 (.42)
lway Gazette, No. 3, January 19, p. 95.
idea Park to Shenfield widening, L. N. E. R. (3 000 rds & fig.)

1934 347 .763 (.42)
lway Gazette, No. 3, January 19, p. 104.
oad and Rail Traffic Act, 1933. (1 200 words.)

1934 625 .175 (.42)
lway Gazette, No. 3, January 19, p. 105.
oad-railer for permanent way work. (900 words ig.)

1934 625 .143.3
lway Gazette, No. 4, January 26, p. 125.
he rail wear problem. (1 200 words.)

1934 625 .143.5 (.42)
ilway Gazette, No. 4, January 26, p. 132.
ew chair fastening for British standard track. 0 words & fig.)

1934 621 .132.3 (.43)
ilway Gazette, No. 4, January 26, p. 133.
team locomotives for high-speed service in Germany. 000 words & fig.)

1934 621 .139 (.42) & 656 .212.6 (.42)
ilway Gazette, No. 4, January 26, p. 135.
Handling railway scrap. (800 words & fig.)

1934 656 .254
ilway Gazette, No. 5, February 2, p. 180.
Cab signalling or automatic train control. (4 500 rds.)

1934 656 .254 (.44) & 656 .212.5 (.44)
ilway Gazette, No. 5, February 2, p. 183.
New methods of working marshalling yards. (1 500 rds & fig.)

1934 621 .43
ilway Gazette, No. 5, February 2, p. 187.
Light all-metal railcar for India. (900 words & fig.)

1934 621 .335 (.42) & 621 .43 (.42)
esel Railway Traction, p. 154, Supplt. to the Railw. Gazette, January 26.
An up-to-date engine for railway traction. High-eed light-weight unit with electric transmission. 300 words & fig.)

1934 621 .43
esel Railway Traction, p. 156, Supplt. to the Railw. Gazette, January 26.
Control for Diesel-electric vehicles. Constant-power aracteristics of simple hydraulically operated control stem. (1 200 words & fig.)

1934 621 .43 (.73)
esel Railway Traction, p. 158, Supplt. to the Railw. Gazette, January 26.
The largest locomotive Diesel engine. (2 000 words fig.)

1934 621 .43 (.43)
Diesel Railway Traction, p. 160, Supplt. to the Railw. Gazette, January 26.
Directly-driven Diesel locomotive. High-power supercharged German machine undergoing running trial shows encouraging results. (1 500 words & fig.)

1934 621 .335 & 621 .43
Diesel Railway Traction, p. 162, Supplt. to the Railw. Gazette, January 26.
Possibilities of high-speed. — Streamlined trains hauled by powerful Diesel-electric locomotives. (2 200 words & fig.)

1934 621 .43 (.8)
Diesel Railway Traction, p. 165, Supplt. to the Railw. Gazette, January 26.
Diesels on the roof of the world. (Metre-gauge railcars maintain passenger traffic in the Andes (600 words & fig.)

1934 621 .43 (.54)
Diesel Railway Traction, p. 167, Supplt. to the Railw. Gazette, January 26.
Indian railcar results. (350 words & fig.)

1934 621 .335 (.73) & 621 .43 (.73)
Diesel Railway Traction, p. 168, Supplt. to the Railw. Gazette, January 26.
Large locomotive for the Erie Railroad. Heavy shunting performed at low overall cost by Diesel-electric system. (600 words & fig.)

1934 621 .33 (.438)
Electric Railway Traction, p. 70, Supplt. to the Railw. Gazette, January 12.
Electrification in Poland. (1 000 words, 3 tables & fig.)

1934 621 .337 (.42)
Electric Railway Traction, p. 72, Supplt. to the Railw. Gazette, January 12.
Control gear for multiple-unit suburban trains. (2 600 words & fig.)

1934 621 .33 (.81)
Electric Railway Traction, p. 76, Supplt. to the Railw. Gazette, January 12.
Paulista Railway electrification. (1 400 words, 1 table & fig.)

1934 621 .39 (.485) & 625 .234 (.485)
Electric Railway Traction, p. 79, Supplt. to the Railw. Gazette, January 12.
Electric heating of railway carriages. (900 words & fig.)

1934 621 .33 (.42) & 625 .4 (.42)
Electric Railway Traction, p. 80, Supplt. to the Railw. Gazette, January 12.
The London Underground electrical equipment. (1 200 words & fig.)

1934 621 .336
Electric Railway Traction, p. 83, Supplt. to the Railw. Gazette, January 12.
HUG (Ad. M.). — Reducing the weight of contact lines. (600 words & fig.)

Railway Magazine. (London.)

1934 **656 .222.1 (.42 + .73)**
Railway Magazine, February, p. 87.
ALLEN (C. J.). — **British locomotive practice and performance.** (4 000 words & fig.)

1934 **385 (091 (.53)**
Railway Magazine, February, p. 109.
MYTTON-DAVIES (C.). — Railways of the Near East. I. — **The Hedjaz Railway.** (3 000 words & fig.)

Railway Mechanical Engineer. (Philadelphia.)

1934 **62. (01, 621 .135.2 & 625 .214**
Railway Mechanical Engineer, January, p. 1.
JOB (R.). — **Service testing of journal lubricants.** (2 200 words.)

1934 **625 .244 (.4)**
Railway Mechanical Engineer, January, p. 11.
A mechanically cooled European **refrigerator car.** (1 800 words & fig.)

1934 **621 .43**
Railway Mechanical Engineer, January, p. 13.
GUILLOT (F.). — **Electric starting of Diesel engines.** (1 400 words & fig.)

Railway Signaling. (Chicago.)

1934 **313 : 656 .25 (.73)**
Railway Signaling, January, p. 21.
Junction on the Santa Fe **is remotely controlled.** (2 000 words & fig.)

1934 **656 .256.2 (.73)**
Railway Signaling, January, p. 25.
ZANE (W. F.). — **Remote control** on the Burlington. (1 800 words & fig.)

1934 **625 .162 (.73) & 656 .259 (.73)**
Railway Signaling, January, p. 28.
Crossing gate with light signals installed at railroad crossing. (1 000 words & fig.)

1934 **656 .256.3 (.73)**
Railway Signaling, January, p. 31.
Automatic interlocking in train-control territory. (1 400 words & fig.)

1934 **656 .259 (.73)**
Railway Signaling, January, p. 33.
Drawbridge locking on the New York, New Haven & Hartford. (1 400 words & fig.)

South African Railways and Harbours Magazine. (Johannesburg.)

1933 **385. (093 (.43)**
South African Railw. and Harbours, November, p. 1269.
SCHWARZENSTEIN (F. F.). — A century of Germany **railway history.** (2 400 words & fig.)

The Locomotive. (London.)

1934 **621 .43 (**
The Locomotive, January 15, p. 5.
200-H.P. **Diesel-electric rail coach working** on L. M. S. Ry. (1 500 words & fig.)

1934 **621 .132.3 (**
The Locomotive, January 15, p. 14.
Rebuilt « Pacific » locomotive Paris-Orléans. (words & fig.)

1934 **621**
The Locomotive, January 15, p. 21.
Electric locomotive design. — VII. — Driving motive design. (1 500 words & fig.)

Transit Journal. (New York.)

1934 **621 .335 (.73) & 625 .62 (**
Transit Journal, February, p. 43.
Columbus **trolley buses** win public approval. (words & fig.)

1934 **62 (.73), 621 .335 (.73) & 621 .43 (**
Transit Journal, February, p. 53.
Combination **gas-trolley bus developed.** (500 w & fig.)

In Spanish.

Anales de la Asociación de Antiguos Alumn del I. C. A. I. (Madrid.)

1934 **621**
Anales de la Asociación de Antiguos Alumnos, e p. 28.
GAGO (E. G.). — Nueva aplicación de la **solda eléctrica** en la industria ferroviaria. (1 100 pala & fig.)

Ferrocarriles y Tranvias. (Madrid.)

1934 **62**
Ferrocarriles y Tranvias, enero, p. 3.
SANTIAGO (E.). — **Automotores para ferrocar** con motor de combustión interna. (4 600 pala & fig.)

1934 **62**
Ferrocarriles y Tranvias, enero, p. 11.
VALENTÍ DE DORDA (J.). — La evolución d **automotores** de combustión interna. (4 200 pala & fig.)

1934 **62**
Ferrocarriles y Tranvias, enero, p. 16.
BURNHAM GRANDIN (T.). — La importancia nómica de los **automotores.** (7 700 palabras.)

1934 **621 .43 (.460)**
Ferrocarriles y Tranvias, enero, p. 25.
AZA (P.). — Los **automotores** de la Compañía del Norte. (2 000 palabras & fig.)

1934 **621 .335 & 621 .43**
Ferrocarriles y Tranvias, enero, p. 19.
BASTOS (M.). — **Trenes rápidos Diesel-eléctricos.** (3 100 palabras & fig.)

1934 **621 .335 & 621 .43**
Ferrocarriles y Tranvias, enero, p. 35.
O'BRIEN (R. J.). — Posibilidad de obtener economías en las líneas ferroviarias mediante el empleo de **automotores y locomotoras Diesel-eléctricos.** (5 200 palabras & fig.)

1934 **621 .132.8 (.460) & 621 .43 (.460)**
Ferrocarriles y Tranvias, enero, p. 43.
RIBERA (J. E.). — Ensayos de **autocarriles** en España. (8 100 palabras & fig.)

1934 **313 .385 (.460) & 621 .43 (.460)**
Ferrocarriles y Tranvias, enero, p. 53.
Resultados de la explotación con **automotores** en España. (2 300 palabras.)

1934 **621 .132.8 & 621 .4**
Ferrocarriles y Tranvias, enero, p. 56.
SIEGRIST (E.). — Los **automotores de gasolina.** (4 500 palabras & fig.)

Ingenieria y Construcción. (Madrid.)

1934 **624**
Ingenieria y Construcción, febrero, p. 57.
CASADO (C. F.). — Las **estructuras** durante 1933. (2 400 palabras & fig.)

Revista de Ingenieria Industrial. (Madrid.)

1934 **625 .2 (0**
Revista de Ingenieria Industrial, enero, p. 1.
LAFFITTE (C.). — **Movimiento de lazo** de los vehículos ferroviarios. (3 300 palabras & fig.)

Revista de Obras Publicas. (Madrid.)

1934 **624**
Revista de Obras publicas, N° 3, 1° de febrero, p. 41; n° 4, 15 de febrero, p. 61.
CASADO (C. F.). — Colección de **puentes de altura estricta.** (4 000 palabras & fig.)

1934 **624 .63 (.460)**
Revista de Obras publicas, n° 4, 15 de febrero, p. 66.
BURGUERA (J.) & LEYDA (G.). — **Puente de Aragón, sobre el Turia, en Valencia.** (3 200 palabras & fig.)

In Italian.

La tecnica professionale. (Firenze.)

1934 **621 .138**
La tecnica professionale, febbraio, p. 38.
ROMERO (R.). — Nota sulla **manutenzione delle locomotive a vapore.** (3 900 parole.)

1934 **621 .135.3 & 625 .213**
La tecnicca professionale, febbraio, p. 43.
DUTTO. — Sui cedimenti elastici delle **molle.** (3 900 parole & fig.)

Rivista tecnica delle ferrovie italiane. (Roma.)

1934 **625 .245 (.45) & 656 .225 (.45)**
Rivista tecnica delle ferrovie italiane, N° 1, 15 gennaio, p. 1.
FORTE (G.) & PALMIERI (D.). — Prime esperienze sulle « **casse mobili refrigeranti** » destinate al trasporto di derrate deperibili in Italia. (3 800 parole & fig.)

1934 **624 .32 (.45)**
Rivista tecnica delle ferrovie italiane, N° 1, 15 gennaio, p. 14.
ORLANDINI (E.). — Il nuovo **viadotto** sul vallone Angiemo al km. 68.335 della linea Battipaglia — Reggio Calabria. (5 800 parole & fig.)

1934 **625 .234 (.73)**
Rivista tecnica delle ferrovie italiane, N° 1, 15 gennaio, p. 29.
SPANI (D. F.). — **Condizionamento dell' aria** su vetture ferroviarie negli Stati Unitî dell' America del Nord. (6 500 parole & fig.)

In Dutch.

De Ingenieur. (Den Haag.)

1934 **721 .9**
De Ingenieur, N° 2, 2 Februari, p. Bt. 9.
VAN RAVESTEIJN (S.). — **Gewapend beton-architectuur.** (5 400 woorden & fig.)

1934 **385 .113 (.4)**
De Ingenieur, N° 7, 16 Februari, p. A. 61.
Bedrijfsresultaten van spoorwegen in West-Europa. (600 woorden.)

Spoor- en Tramwegen. (Utrecht.)

1934 **621 .335 (.492) & 621 .43 (.492)**
Spoor en Tramwegen, N° 3, 30 Januari, p. 57.
HUPKES (W.). — **Diesel-electrische treinen** der Nederlandsche Spoorwegen. (1 900 woorden & fig.)

1934 **625 .1 (.92)**

Spoor en Tramwegen, N° 3, 30 Januari, p. 62.

ELLERBROEK. — **De aanleg van de spoorlijn** Lahat-Loeboeklinggau (Zuid-Sumatra). (2 500 woorden & fig.) (Wordt vervolgd.)

In Portuguese

Boletim do Instituto de Engenharia (S. Paulo). (Brasil.)

1934 **624 .63 (.44)**

Boletim do Instituto de Engenharia, dezembro, p. 326.

CHRISTIANI & NIELSEN. — **A ponte** de Castelmoron. (3 700 palavras & fig.)

1934 **691 (.43)**

Boletim do Instituto de Engenharia, dezembro, p. 354.

JUNQUEIRA (J. A.). — **Normas da commissão allemã de concreto armado,** 1932. (4 500 palavras & fig.) (Continúa.)

Gazeta dos caminhos de ferro. (Lisboa.)

1934 **656 .2 (.46**

Gazeta dos caminhos de ferro, 1 de fevereiro, p. 73

FERREIRA (V.). — **Os caminhos de ferro na organização nacional dos transportes e do turismo.** (3 palavras.)

1934 **656 .1 & 656**

Gazeta dos caminhos de ferro, 1 de fevereiro, p. 84

FERREIRA (V.). — **Caminhos de ferro e automóv** (1 200 palavras.)

Revista das Estradas de ferro. (Rio de Janeir

1934 **656 .1 & 656**

Revista das Estradas de ferro, N° 204, 15 de Janei p. 356.

OLIVEIRA (B. M. de). — **Conferencia e coordenaç** dos transportes feitos por via ferrea e de rodage (3 700 palavras.)

M. Weissenbruch Co., Ltd., Printer of the King, 49, rue du Poinçon, Bruxelles.

MONTHLY BIBLIOGRAPHY OF RAILWAYS [1].

PUBLISHED UNDER THE SUPERVISION OF

P. GHILAIN,

General Secretary of the Permanent Commission of the International Railway Congress Association.

MAY (1934)

016. 385. (02]

I. — BOOKS.

In French.

934 355
RANCHES (J.).
es chemins de fer pendant la grande guerre.
gueira du Foz (Portugal), Typografia Peninsular.
olume (18 × 25), 275 pages.

934 351. (08 (.44)
nnuaire des travaux publics (France). Années 1933-
.
aris, A. Dumas, 5, rue Jules Lefebvre. 1 volume,
pages. (Prix : 40 francs français.)

934 669 .1
RNERIAS (R.).
anuel des aciéries.
aris (6e), J. B. Baillière et Fils, 19, rue Haute-
lle. 1 volume (11.5 × 16 cm.), 268 pages et 89 fi-
s. (Prix : 19 francs français.)

934 621 .132.8 & 621 .13
NCO & LABRYN (P.).
ocomotives et automotrices à moteurs à combustion
rne.
ége, Librairie Polytechnique, Ch. Béranger, 1, quai
Grande-Bretagne. 1 volume, 268 pages, 185 figures.
x : 112.50 francs belges.)

934 656 .28
LY.
s accidents sur les voies publiques, urbaines et
ières.
aris (6e), Dunod, 92, rue Bonaparte. 1 volume
× 25 cm.), 340 pages. (Prix : 45 francs français.)

934 621 .43
LDT (P. M.).
s moteurs Diesel à grande vitesse.
aris (6e), Dunod, 92, rue Bonaparte. 1 volume
× 21 cm.), 440 pages et 225 figures. (Prix :
rancs français.)

1934 656. (02
MAISON (F.).
Exploitation technique des chemins de fer.
Liége, Librairie polytechnique, Ch. Béranger, quai de la Grande-Bretagne, 1. 1 volume, 372 pages, 270 figures. (Prix : 225 francs belges.)

1934 691
MERCIOT (A.).
Manuel du cimentier.
Paris, Garnier Frères. 1 volume (12 × 19 cm.), 208 pages, 76 gravures. (Prix : 9 francs français.)

1934 669
METZ (N.).
Le laminage du fer à chaud et le tracé des cannelures des cylindres de laminoirs basé sur les recherches expérimentales du flux du fer dans les barres.
Liége, Protin et Vuidar. 1 volume (24 × 32 cm.), 410 pages, 16 planches et 763 figures.

1934 621
ROLAND.
Guide théorique et formulaire pratique d'atelier.
Paris, Desforges, Girardot et Cie, 27-29, quai des Grands-Augustins. 1 volume, 247 pages. (Prix : 18 francs français.)

1934 313 .385 (.494)
Statistique des chemins de fer suisses.
Berne, Département fédéral des chemins de fer. 1 volume. (Prix : 10 francs français.)

1934 313 .385
Statistique internationale des chemins de fer, année 1932.
Paris (17e), Secrétariat de l'Union Internationale des Chemins de fer, 10, rue de Prony. 1 volume (24 × 31.5 cm.) (Prix : 50 francs français.)

1933 347 .762
TRAVERS (M.).
Le Droit commercial international. Volume V : Contrat de transport par terre et par air, Commissionnaire de transport.
Paris, Librairie du Recueil Sirey, 22, rue Soufflot. 1 volume, 882 pages.

(1) The numbers placed over the title of each book are those of the decimal classification proposed by the Railway Congress jointly with the Office Bibliographique International, of Brussels. (See « Bibliographical Decimal Classification as applied to lway Science », by L. Weissenbruch, in the number for November 1897, of the *Bulletin of the International Railway Congress*, 509).

In Italian.

1934 624 .5
BOHNY (C. M.).
Hängebrücken. Beiträge zu ihrer Berechnung und Konstruktion.
Leipzig, Johann Ambrosius Barth. und Brüssel, Falk, Fils, 22 rue des Paroissiens. 1 Band, 94 Seiten und 61 Textabbildungen. (Preis : 10 R.M.)

1934 624 (.43)
KARIG (J.).
Neuere Stahlbrücken der Deutschen Reichsbahn.
Leipzig, Johann Ambrosius Barth, und Brüssel, Falk, Fils, 22, rue des Paroissiens. 1 Band, 96 Seiten und Abbildungen. (Preis : 6.70 R.M.)

1934 656 .24
METZEL (K.).
Schädlingsbekämpfung im Bahnbereiche.
Berlin, Verkehrswissenschaftliche Lehrmittelgesellschaft m. b. H. bei der Deutschen Reichsbahn. 1 Band, 86 Seiten. (Preis : 1.50 R.M.)

1934 621 .116
MÜNZINGER (F.).
Dampfkraft. Berechnung und Bau von Wasserrohrkesseln und ihre Stellung in der Energieerzeugung. Ein Handbuch für den praktischen Gebrauch.
Berlin, Julius Springer. 1 Band, 348 Seiten, 566 Abbildungen, 44 Rechnungsbeispielen, 41 Zahlentafeln und 20 Kurventafeln. (Preis : 40 R.M.)

1934 621 .116
NUBER (F.).
Wärmetechnische Berechnung der Feuerungs- und Dampfkessel-Anlagen.
Leipzig, Johann Ambrosius Barth und Brüssel, Falk, Fils, 22, rue des Paroissiens. 1 Taschenbuch, 133 Seiten. (Preis : 3.50 R.M.)

1934 621 .9
PREGER (E.).
Spangebende Formung der Metalle in Maschinenfabriken durch Werkzeuge und Werkzeugmaschinen.
Leipzig, Dr. Max Jänecke. 1 Band, 40 Seiten und 41 Abbildungen. (Preis : 1.60 R.M.)

1934 665 .882
RIMARSKI (W.).
Forschungsarbeiten auf dem Gebiete des Schweissens und Schneidens mittels Sauerstoff und Azetylen.
Halle a. S. Carl, Marhold. 1 Band, 119 Seiten, 168 Abbildungen und 31 Zahlentafeln. (Preis : 4.90 R.M.)

1934 691
WEESE (E.).
Eisenbeton-Zahlentafeln.
Leipzig, Johann Ambrosius Barth und Brüssel, Falk, Fils, 22, rue des Paroissiens. 1 Band, 25 Seiten. (Preis : 18 R.M.)

In English.

1934 385. (02 (.73) & 385. (072 (
American railroad in laboratory.
Washington, D. C. American Railway Associa
Car Service Division, Transportation Building, 17th
H. Streets, N. W. (6 × 9 inches), 544 pages. (Pr
50 cents.)

1934 385.
DICKINSON (H. W.) & TITLEY (A.).
Richard Trevithick, the engineer and the man.
vithick centenary commemoration volume.
Cambridge. University Press. (Price : 10 sh.
net.)

1933 62
HANSEN (Paul), sub-director, Burmeister & Wam
Copenhagen.
The **Diesel engine** as motive power for locomo
and railcars.
World Power Conference, Sectional Meeting,
divania. A pamphlet, 13 pages & fig.)

1934 62
JUSTIN (J. D.) & MERVINE (W. G.).
Power supply economics.
New York. Published by John Wiley & Sons,
(6 × 9 inches), 276 pages, diagrams and tables. (Pr
$ 3.50.)

1934 385. (08 (
Kenya and Uganda Railways and Harbours. Re
of working, January-December 1933. General Mana
Bulletin No. 11.
Nairobi (Kenya). Office of the General Manag
Railways and Harbours. 23 pages.

1934
KOFOID (Charles A.), editor-in-chief.
Termites and termite control. A report to the
mite Investigations Committee.
Berkeley (Cal.), University of California Press.
don. Cambridge University Press. (Price : 22 sh.
net.)

1934 6
MEYRICK-JONES (L. M.).
Commercial motor road transport.
London. Sir Isaac Pitman & Sons, Ltd. (Pr
15 sh. net.)

1934 38 &
MILLER (S. L.).
Inland transportation.
London & New York. Published by McGraw
Book Co. (6 × 9 inches), 822 pages, tables and
grams. (Price : $ 4.00.)

1934 625 .234 &
MOYER (J. A.) & FITTS (R. U.).
Air conditioning.
New York. Published by the McGraw-Hill Book
Inc. (6 × 9 inches), 390 pages, illust. (Price : $ 4

1934 691 & 721 .9
OTT (W. L.), M. Inst. C. E., & GLANVILLE (W. H.), D. Sc., Ph. D.
Explanatory handbook on the code of practice for nforced concrete.
London, S. W. 1, Concrete Publications, Ltd., Darthmouth-street. (Price : 8 sh. net.)

1933 385. (071.3
RIMSHAW (Stewart), Ph. D., professor of economics and industrial relations, Marquette University.
Apprenticeship.
New York. Published by the McGraw-Hill Book Co., pages. (Price : $ 2.50.)

1934 65
MPSON (H. A.), F. C. W. A.
ndustrial accountancy.
London. E. C. 4, Longmans Green & Co. Ltd., Paternoster Row. (6 × 1 1/4 inches), 268 pages. rice : 10 sh. 6 d. net.)

1934 624 .2
EINMAN (D. B.), A. M., C. E., Ph. D.
The Wichert truss.
New York. D. Van Nostrand Company, Inc.

1934 625 .172
Stone-Cardew track depression indicator for scientific pection of railroad tracks.
Deptford, London, England. Published by J. Stone Company, Ltd. A pamphlet, 10 pages.

1934 627 .82 (06
Transactions of the first Congress of the International Commission on large dams of the World Power nference.
London, W. C. 2, Percy Lund, Humphries and Co. l.. 12, Bedford-square. (Price : £ 4 the five volumes.)

In Spanish.

1934 385 & 656 .2
IMEDIO (A.).
Ferrocarriles. Explotación y legislación.
Madrid, Instituto ferroviario, Avenida de Pi y Margall, 12, entresuelo, 1 volumen, 1 000 páginas. (Precio : 30 pesetas.)

1934 385
Las entidades económicas y el problema ferroviario.
Madrid, Asociación General de transportes por vía férrea. 1 volumen, 126 páginas.

1934 621 .335 (.462)
NAVARRETE (M.).
La locomotora electrica de gran velocidad de la Compañia del Norte Serie 7.300.
Madrid, Sociedad Española de Construcción Naval. 1 volumen, 48 páginas y 47 figuras.

In Italian.

1934 691 & 721 .9
SANTARELLA (L.).
Il cemento armato.
Leipzig, Johann Ambrosius Barth & Bruxelles, Falk, Fils, 22, rue des Paroissiens. 1 volume, 528 pagine e 450 figure. (Prezzo : 52 Lire.)

1934 69
SANTINI (F.).
Statica e tecnica delle costruzioni.
Leipzig, Johann Ambrosius Barth & Bruxelles, Falk, Fils, 22, rue des Paroissiens. 1 volume, 396 pagine, 146 figure e 15 tavole. (Prezzo : 55 Lire.)

[016. 385. (05]

II. — PERIODICALS.

In French.

Bulletin de la Société des ingénieurs civils de France. (Paris.)

1934 621 .4
ll. de la Soc. des ing. civils de France, septembre-octobre, p. 969.
DARCHE (A.). — Contribution à l'étude de la combustion dans les moteurs. (29 000 mots & fig.)

1934 621 .43
ll. de la Soc. des ing. civils de France, septembre-octobre, p. 1039.
DUMAS (L.). — Les conditions d'emploi des autotrices Diesel sur les grands réseaux de chemins de r. (6 700 mots, 1 carte & fig.)

1934 385. (09 (.59)
Bull. de la Soc. des ing. civils de France, septembre-octobre, p. 1061.
KANDAOUROFF. — Les chemins de fer de l'Indochine. (4 500 mots, 12 tableaux & 1 carte.)

1934 62. (01
Bull. de la Soc. des ing. civils de France, septembre-octobre, p. 1089.
CAQUOT (A.). — L'exploitation par l'ingénieur, de la résistance de la matière. (9 500 mots & fig.)

Bulletin de l'Union internationale des chemins de fer. (Paris.)

1934 385 .113 (.493)
Bull. de l'Union intern. des ch. de fer, janvier, p. 1.
La Société nationale des chemins de fer belges en 1932. (4 600 mots.)

1934 **656 .1 (.43)**
Bull. de l'Union intern. des ch. de fer, janvier, p. 7.
Les **Reichsautobahnen.** (3 400 mots.)

1934 **625 .232**
Bull. de l'Union intern. des ch. de fer, janvier, p. 11.
Wagons-lits et wagons-restaurants. (1 900 mots.)

1934 **656 .1 & 656 .2**
Bull. de l'Union intern. des ch. de fer, janvier, p. 22.
Route et rail. Rapport introductif présenté à la Chambre de Commerce internationale par le Comité d'Experts indépendants. (3 500 mots.)

Bulletin des transports internationaux par chemins de fer. (Berne.)

1934 **656 .223.2**
Bull. des transp. intern. par ch. de fer, février, p. 130.
Wagons spéciaux de particuliers. (2 200 mots.) (A suivre.)

1934 **313 .385 (.489)**
Bull. des transp. intern. par ch. de fer, février, p. 169.
Statistique des Chemins de fer danois pour l'exercice 1932-33. (700 mots.)

Bulletin technique de la Suisse romande. (Vevey.)

1934 **691**
Bull. techn. de la Suisse romande, n° 6, 17 mars, p. 66.
KUNZ (C.). — Le **béton chauffé électriquement.** (1 700 mots & 2 tableaux.)

Chronique des transports. (Paris.)

1934 **656 (.44)**
Chronique des transports, 25 février, p. 2.
La **politique des transports** au Conseil National Economique. (8 000 mots.)

1934 **656 .1 & 656 .2**
Chronique des transports, 10 mars, p. 5.
La **coordination** du rail et de la route. (3 500 mots.)

1934 **656 .1 (.66)**
Chronique des transports, 10 mars, p. 9.
La **réglementation des transports automobiles** en Afrique Occidentale Française. (1 700 mots.)

Génie civil. (Paris.)

1934 **624. (0 & 691**
Génie civil, n° 2689, 24 février, p. 177.
PORTEVIN (A.) & CYMBOLISTE (M.). — **L'avenir du béton armé** et du métal pour les ponts de très grandes portées. (3 800 mots & fig.)

1934 **62**
Génie civil, n° 2690, 3 mars, p. 189.
ANTONI (A.). — Les **machines** à mesurer, poin percer et aléser de précision. (3 800 mots & fig.)

1934 **62. (01 &**
Génie civil, n° 2691, 10 mars, p. 224.
La mesure de la **dureté superficielle et du mod d'élasticité des matériaux** par la méthode du pend de M. P. Le Rolland. (2 300 mots & fig.)

1934 **621 .**
Génie civil, n° 2691, 10 mars, p. 226.
Les **récents progrès réalisés dans la construction chaudières.** (1 700 mots & fig.)

1934 **656 .**
Génie civil, n° 2691, 10 mars, p. 229.
Premiers **transports de denrées périssables** effect en Italie **au moyen de cadres mobiles refroidis.** (mots & fig.)

1934 **621 .132.5 (.73) & 621 .134.3 (.**
Génie civil, n° 2692, 17 mars, p. 237.
MARTIN (H.). — La **locomotive « Loree » à tr expansion** du Delaware and Hudson Railway. (2 mots & fig.)

1934 **72.**
Génie civil, n° 2692, 17 mars, p. 240.
SABOURET (V.). — **L'évolution de la voûte rom** du milieu du XI° siècle au début du XII°. (4 400 m & fig.)

1934 **621 .133.1 & 621**
Génie civil, n° 2692, 17 mars, p. 247.
GAUTIER. — L'emploi des huiles végétales con **combustibles pour moteurs Diesel.** (4 300 mots.)

1934 **665 .**
Génie civil, n° 2692, 17 mars, p. 252.
La **soudabilité des aciers.** (1 900 mots.)

La Science et la Vie. (Paris.)

1934 **385. (01 (.**
La Science et la Vie, mars, p. 219.
MARIVAL (J.). — Avec le « **Congo-océan** » une nouvelle s'ouvre pour notre Congo. (2 300 mots & f

1934 **656**
La Science et la Vie, mars, p. 255.
Sur les chemins de fer : **Sécurité** d'abord. (2 mots & fig.)

1934 **625**
La Science et la Vie, mars, p. 258.
La construction métallique allégée des voitures chemins de fer permet de concilier la sécurité l'économie d'exploitation. (2 600 mots & fig.)

es Chemins de fer et les Tramways. (Paris.)

1934 **625 .6**

es Chemins de fer et les Tramways, mars, p. 54.

La véritable situation des **chemins de fer d'intérêt** cal. Leur déclassement est-il justifié ? (6 300 mots.)

1934 **621 .43 (.44)**

es Chemins de fer et les Tramways, mars, p. 60.

Quelques types d'**automotrices** utilisées sur des seaux de voies ferrées d'intérêt local. (8 000 mots fig.)

1934 **621 .43**

es Chemins de fer et les Tramways, mars, p. 66.

Automotrice « La Francine » de la Société Centrale Chemins de fer et d'Entreprises. (6 500 mots & fig.)

1934 **621 .43**

es Chemins de fer et les Tramways, mars, p. 71.

Le moteur sans soupapes appliqué à **l'automotrice.** 100 mots & fig.)

1934 **625 .259**

es Chemins de fer et les Tramways, mars, p. 73.

ZOUCKERMANN (A.). — **Le freinage magnétique** r rail dans les chemins de fer. (6 000 mots & fig.)

L'Industrie des voies ferrées et des transports automobiles. (Paris.)

1934 **621 .4 (.44)**

Industrie des voies ferrées et des transports automobiles. février, p. 53.

Les automotrices à essence de la Régie départementale des Tramways de l'Ain. (1 800 mots & fig.)

1934 **656**

Industrie des voies ferrées et des transports automobiles. février, p. 177.

LE BESNERAIS. — **Liaison entre le chemin de fer l'automobile** pour les transports directs de voyaurs, bagages, colis de marchandises. (4 300 mots.)

1934 **656 .1 (.4)**

Industrie des voies ferrées et des transports automobiles. février, p. 182.

VENTE. — Les législations européennes de **transrts par automobiles.** (3 200 mots.)

L'Ossature métallique. (Bruxelles.)

1934 **624 .2 & 669 .1**

Ossature métallique. février, p. 93.

BLEICH (F.). — La **ductilité de l'acier.** (5 200 mots fig.)

Revue de l'Ecole polytechnique. (Bruxelles.)

1934 **62. (01**

evue de l'Ecole polytechnique, décembre, p. 87.

BAES (L.) & BLANJEAN (L.). — Calcul des **enveppes cylindriques soumises à de fortes différences de** ressions. (4 600 mots & fig.)

Revue générale des chemins de fer. (Paris.)

1934 **621 .132.8 (.44) & 621 .43 (.44)**

Revue générale des chemins de fer, mars, p. 237.

DUMAS (L.). — Les **premières automotrices** des Grands Réseaux de chemins de fer français. (12 200 mots & fig.)

1934 **625 .14 (01**

Revue générale des chemins de fer, mars, p. 262.

MAUZIN (A.). — **Mesure des efforts latéraux des véhicules sur le rail.** (3 400 mots & fig.)

1934 **385 .587 (.44)**

Revue générale des chemins de fer, mars, p. 271.

WARNIEZ. — **Organisation de l'atelier de construction** des appareils de voie aux ateliers et magasins de la voie du Moulin-Neuf de la Compagnie du Nord. (3 600 mots & fig.)

1934 **621 .43**

Revue générale des chemins de fer, mars, p. 281.

PLACE (P.). — **Locotracteur** de 240 chevaux à transmission mécanique pour voie de 0 m. 60. (4 200 mots & fig.)

1934 **656 .211.5 (.43)**

Revue générale des chemins de fer, mars, p. 305.

Dispositif d'annonce au public de l'heure de départ des trains. (800 mots & fig.)

1934 **625 .212**

Revue générale des chemins de fer, mars, p. 315.

Roue trempée et recuite type Q. T. unifié des Chemins de fer américains. (1 100 mots & fig.)

Revue universelle des Mines. (Liége.)

1934 **669 .1 & 691**

Revue universelle des mines, n° 5, 1er mars, p. 117.

MARNEFFE (A. de). — Les réactions de l'**acier** vis-à-vis de la concurrence du **béton armé.** (4 300 mots & fig.) (A suivre.)

1934 **691**

Revue universelle des mines, n° 5, 1er mars, p. 130.

KELECOM (P. E.). — Etat actuel de la question de la protection des métaux contre la **corrosion.** Ses développements les plus récents. (2 800 mots & fig.) (A suivre.)

1934 **669 .1 & 691**

Revue universelle des mines, n° 6, 15 mars, p. 132.

MARNEFFE (A. de). — Les réactions de l'**acier** vis-à-vis de la concurrence du **béton armé.** (5 300 mots & fig.)

1934 **691**

Revue universelle des mines, n° 6, 15 mars, p. 158.

KELECOM (P. E.). — Etat actuel de la question de la protection des métaux contre la **corrosion.** Ses développements les plus récents. (3 300 mots & fig.)

In German.

Elektrische Bahnen. (Berlin.)

1934 **621 .335 (.43) & 656 .222.1 (.43)**
Elektrische Bahnen, Februar, S. 25.
WOLFGANG STEINBAUER. — **Schnellfahrten mit elektrischen 1 Co 1-Reichsbahn-Schnellzuglokomotiven** (Bauart A. E. G.) auf der Strecke München-Stuttgart. (4 300 Wörter, 3 Tafeln & Abb.)

1934 **621 .33 (.4)**
Elektrische Bahnen, Februar, S. 31.
KURT-HELLMUT ROLLERT. — Die Entwicklung der **elektrischen Zugförderung** in den ausserdeutschen Ländern. (2 900 Wörter & 2 Karte.) (Fortsetzung folgt.)

1934 **621 .33 (.494)**
Elektrische Bahnen, Februar, S. 36.
DÜRLER (W.). — **Zehn Jahre voller elektrischer Betrieb** der Rhätischen Bahn. (6 700 Wörter, 3 Tabellen & Abb.)

Glasers Annalen. (Berlin.)

1934 **385 .113 (.44)**
Glasers Annalen, Heft 3, 1. Februar, S. 17.
WERNEKKE. — Die **französischen Eisenbahnen** im Jahre 1932. (4 300 Wörter.)

1934 **625 .2 (.73) & 669 (.73)**
Glasers Annalen, Heft 3, 1. Februar, S. 21.
THEOBALD. — Zehn Jahre **Aluminium-Leichtbau** an amerikanischen Eisen- und Strassenbahnwagen. (1 100 Wörter.)

1934 **625 .4**
Glasers Annalen, Heft 4, 15. Februar, S. 25.
MÜLLER (D. A. H.). — Das **Schwebzugsystem.** Neue Formen von Hängebahnen und ihre verkehrswirtschaftliche Bedeutung für Massengut- und Personenbeförderung. (3 800 Wörter & Abb.)

Organ für die Fortschritte des Eisenbahnwesens. (Berlin.)

1934 **621 .133.7 (.43)**
Organ für die Fortschritte des Eisenbahnwesens, Heft 4, 15. Februar, S. 61.
WAGNER (R. P.). — Über Verbesserungen in der **Lokomotivkesselspeisung** bei der Deutschen Reichsbahn-Gesellschaft. (3 100 Wörter & Abb.)

1934 **621 .132.6 (.492)**
Organ für die Fortschritte des Eisenbahnwesens, Heft 4, 15. Februar, S. 64.
LABRIJN (P.). — Die **2 D 2-Tenderlokomotiven** Reihe 6300 der Niederländischen Eisenbahnen. (2 200 Wörter & Abb.)

1934 **621 .**
Organ für die Fortschritte des Eisenbahnwese
Heft 4, 15. Februar, S. 68.
SCHÖNHERR. — Prüfung von **Verbrennungsmot**
ren. (2 700 Wörter & Abb.)

1934 **621 .134**
Organ für die Fortschritte des Eisenbahnwese
Heft 4, 15. Februar, S. 72.
HELBING. — Die genaue **Bestimmung der Treib- u**
Kolbenstangenlänge bei Lokomotiven mit schräg
genden Zylindern. (1 500 Wörter & Abb.)

1934 **656 .1 (.43) & 656 .261 (.4**
Organ für die Fortschritte des Eisenbahnwese
Heft 4, 15. Februar, S. 83.
Das fahrbare **Anschlussgleis** der Deutschen Reic
bahn. (400 Wörter & Abb.)

1934 **656 .256.3 (.49**
Organ für die Fortschritte des Eisenbahnwese
Heft 5, 1. März, S. 85.
VERSTEGEN (J. H.). — Der **selbsttätige Strecke**
block auf den Niederländischen Eisenbahnen. (9
Wörter & Abb.)

1934 **625 .144.4 (.4**
Organ für die Fortschritte des Eisenbahnwese
Heft 5, 1. März, S. 96.
DRAESEL. — Der **Weichenkranwagen** der Reic
bahndirektion Essen. (3 400 Wörter & Abb.)

1934 **625 .143**
Organ für die Fortschritte des Eisenbahnwese
Heft 5, 1. März, S. 101.
AMMANN & GRUENEWALD (v.). — Der **Wid**
stand des Gleises gegen Längs- und Querverschiebu
(1 000 Wörter & Abb.)

Zeitschrift des Vereines Deutscher Ingenieu (Berlin.)

1934 **691 & 6**
Zeitsch. des Ver. deutsch. Ing., Nr. 8, 24. Febru
S. 245.
VOIGT (H.) & RAMSPECK (E.). — Günstig
Holztrocknung. (2 500 Wörter & Abb.)

1934 **385 (.4**
Zeitsch. des Ver. deutsch. Ing., Nr. 8, 24. Febru
S. 248.
Die **Deutsche Reichsbahn** im Jahre 1933. (1
Wörter.)

1934 **621 .13**
Zeitsch. des Ver. deutsch. Ing., Nr. 9, 3. März, S. 2
WAGNER (R. P.). — Verbesserungen an der **Lok**
motivkesselspeisung bei der Deutschen Reichsba
(600 Wörter & Abb.)

1934 **625 .245 & 656 .2**
Zeitsch. des Ver. deutsch. Ing., Nr. 10, 10. März, S. 3
AHLBRECHT (H.). — Entwicklung des **Behält**
verkehrs. (1 700 Wörter & Abb.)

1934 **656 .1 (.43) & 624 (.43)**
itsch. des Ver. deutsch Ing., Nr. 11, 17. März, S. 339.
EISELIN (O.). — Die **Übersteigungsbrücke** für die
ichsautobahnen. (3 000 Wörter & Abb.)

Zeitschrift für das gesamte Eisenbahn-Sicherungswesen. (Berlin.)

1934 **656 .253**
itsch. für das gesamte Eisenb.-Sicherungswesen,
Nr. 3. 20. Februar, S. 29; Nr. 4, 10. März, S. 55.
BUDDENBERG. — Das **dreibegriffige Vorsignal.**
200 Wörter & Abb.)

1934 **656 .254 (.43)**
itsch. für das gesamte Eisenb.-Sicherungswesen,
Nr. 4, 10. März, S. 45.
KRAUSKOPF. — Die **elektromagnetische (induktive)**
gbeeinflussung bei der Deutschen Reichsbahn. (3 900
örter & Abb.)

Zeitung des Vereins Mitteleuropäischer Eisenbahnverwaltungen. (Berlin.)

1934 **656 .231 (.43)**
itung des Vereins mitteleurop. Eisenbahnverwalt.,
Nr. 8, 22. Februar, S. 149.
Die Ständige **Tarifkommission** der Deutschen Eisen-
hnen in ihrer neuen Gestalt. (3 000 Wörter.)

1934 **621 .432.8 & 656 .1**
itung des Vereins mitteleurop. Eisenbahnverwalt.,
Nr. 8, 22. Februar, S. 153; Nr. 9, 1. März, S. 192.
GANZENMÜLLER (A.). — Der Bau und die Wirt-
haftlichkeit von **Schienen-Strassenfahrzeugen.** (7 000
örter, 4 Tafeln & Abb.)

1934 **656 .225**
itung des Vereins mitteleurop. Eisenbahnverwalt.,
Nr. 9, 1. März, S. 169.
SOMMERLATTE. — Neuzeitlicher **Stückgutdienst.**
000 Wörter, 2 Karte & Abb.)

1934 **656 .234 (.43)**
itung des Vereins mitteleurop. Eisenbahnverwalt.,
Nr. 11, 15. März, S. 209.
WENTZEL. — Zur Änderung des **Personentarifs im**
senbahnverkehr. (3 100 Wörter & Abb.)

In English.

Bulletin, American Railway Engineering Association. (Chicago, Ill.)

1933 **656 .237 (.73) & 657 (.73)**
ll., Amer. Ry. Engineering Ass^{on}, December, p. 579.
Report of Committee on **records and accounts.** —
bliography on subjects pertaining to records and
counts. — **Drawing and drafting room practice.** —
int facility records. — **Statistical requirements of**
erating, accounting and other departments with
respect to maintenance of way and structures. — Methods and forms for gathering the data for keeping up to date valuation and other records of the property of railways, etc. (8 000 words & fig.)

1933 **613 (.73)**
Bull., Amer. Ry. Engineering Ass^{on}, December, p. 621.
Report of Committee on **water service and sanitation.** — Cause and extent of pitting and corrosion of locomotive boiler tubes and sheets. — Methods and value of water treatment with respect to estimating and summarizing possible savings effected. — Developments in pipe joints. — Essentials of mosquito control. — Disinfectants, fumigants, and cleaning materials. (9 500 words & fig.)

1933 **385 .587 (.73) & 625 .17 (.73)**
Bull., Amer. Ry. Engineering Ass^{on}, December, p. 645.
Report of Committee on **economics of railway labor.** — Methods of reducing work-train service and economics in maintenance expenses effected thereby. — Programming of bridge and building work. — Revised plans for outfit cars for maintenance of way department employees. — Gang organization and methods of performing maintenance of way work. (6 700 words & fig.)

1933 **625 .141 (.73)**
Bull., Amer. Ry. Engineering Ass^{on}, December, p. 663.
Report of Committee on **ballast.** — Specifications for prepared gravel ballast, including best method of testing for hardness, abrasion and resistance to weatherings. — Specifications for stone ballast, including best method of testing resistance to weathering. — Comparative cost of maintaining track on various kinds of ballast. — Determine proper depth and kind of sub-ballast. (4 000 words & fig.)

1934 **625 .111 (.73)**
Bull., Amer. Ry. Engineering Ass^{on}, January, p. 671.
Report of Committee on **economics of railway location.** — Definition and effect of « rise-and-fall ». (2 000 words & fig.)

1934 **656 .22 (.73)**
Bull., Amer. Ry. Engineering Ass^{on}, January, p. 675.
Report of Special Committee on **clearances.** — Outline diagram. — Proposed A. R. A. standard box car. (1 fig.)

1934 **627 (.73) & 656 .213 (.73)**
Bull., Amer. Ry. Engineering Ass^{on}, January, p. 677.
Report of Committee on **rivers and harbors.** — Definitions of terms. — Specifications for construction of river bank protection. — Types of fender systems for protecting wharves. — Coal and ore piers. — Economic principles involved in clearances over navigable waterways. — Bridges over navigable waterways. (11 500 words & fig.)

1934 **691 (.73) & 693 (.73)**
Bull., Amer. Ry. Engineering Ass^{on}, January, p. 699.
Report of Special Committee on **waterproofing of railway structures.** — Principles governing use of waterproofing or dampproofing of railway structures. — Specifications for membrane waterproofing. (8 000 words.)

1934 **621 .142.4 (.73) & 691 (.73)**
Bull., Amer. Ry. Engineering Ass^{on}, January, p. 713.
Report of Committee on **wood preservation.** — Proposed specification for creosote. — Service test records for treated ties. — Piling used for marine construction. — Specifications for treatment of air-seasoned Douglas Fir. — Destruction of termites and possible ways of prevention, etc. (22 000 words, tables & fig.)

1934 **625 .14 (.73)**
Bull., Amer. Ry. Engineering Ass^{on}, January, p. 779.
Report of Committee on **ties.** — Revision of manual. — Specification for cross-ties and switch-ties. — Substitute ties. — Tie renewals averages per mile maintained. — Standard spacing of spike holes for ties pre-adzed and bored for standard rail sections. — Method of predicting tie renewals. — Type of tie plate best adapted for use with pre-adzed ties. — Economy of use of tie plates which are secured to tie independently of rail fastenings, with particular reference to effect on tie life, etc. (22 000 words, tables & fig.)

1934 **313 : 625 .143.3 (.73) & 625 .143 (.73)**
Bull., Amer. Ry. Engineering Ass^{on}, January, p. 829.
Report of Committee on **rail.** — Revision of manual. — Details of mill practice. — Statistics of rail failures. — Cause and prevention of rail battering. — Economic value of different sizes of rail. — Rail lengths in excess of thirty-ninth feet. — Tests of alloy and heat-treated carbon steel rail. — Redesign of rail sections heavier than 100 lb. per yard. — Heat treating of rail ends to reduce wear. — Joint bar and assembly for 112 lb. R. E. rail. (12 000 words, tables & fig.)

Engineer. (London.)

1934 **621 .115**
Engineer, No. 4074, February 9, p. 154; No. 4075, February 16, p. 182.
GUY (H. L.) & WINSTANLEY (E. V.). — The design of **surface condensing plant.** (8 200 words, tables & fig.)

1934 **656 .254 (.44) & 656 .283 (.44)**
Engineer, No. 4075, February 16, p. 171.
The Lagny **accident.** (2 800 words & fig.)

1934 **62. (064 (.42)**
Engineer, No. 4076, February 23, p. 192.
British Industries Fair. (7 000 words & fig.)

1934 **621 .43 (.42)**
Engineer, No. 4076, February 23, p. 198.
Oil-hydraulic railcar. (2 100 words & fig.)

1934 **621 .115**
Engineer, No. 4076, February 23, p. 204.
GUY (H. L.) & WINSTANLEY (E. V.). — Some factors in the design of **surface condensing plant.** Paper read at the Institution of Mechanical Engineers, February 16, 1934. (6 200 words.)

1934 **621 .87 (.42**
Engineer, No. 4076, February 23, p. 207.
Oil engine-driven **locomotive crane.** (1 300 words fig.)

1934 **621 .335 (.43) & 621 .43 (.43**
Engineer, No. 4076, February 23, p. 209.
Oil-electric **shunting locomotive.** (400 words & fig

1934 **624 .8 (.42**
Engineer, No. 4078, March 9, p. 249.
The Newport **vertical lift bridge.** (3 000 words & fig

1934 **621 .33**
Engineer, No. 4078, March 9, p. 256.
HIGHFIELD (J. S. and W. E.). — **Steel-cored aluminium conductors for transmission.** (3 900 words 3 tables.)

1934 **62 (064 (.43**
Engineer, No. 4078, March 9, p. 258; No. 4079, March p. 274.
Leipzig Technical Fair. (3 700 words & fig.)

1934 **621 .16**
Engineer, No. 4079, March 16, p. 270.
The development of the Parsons **steam turbin** (2 900 words & fig.)

1934 **621 .133**
Engineer, No. 4079, March 16, p. 278.
An automatic **water-hardness recorder.** (1 700 wor & fig.)

1934 **62 (064 (.42**
Supplement to the Engineer, No. 4075, February 16.
The British Industries Fair at Birmingham (9 7 words & fig.)

Engineering. (London.)

1934 **656 .212.6 (.42**
Engineering, No. 3552, February 9, p. 141.
Coal-handling plant at Beckton Gas Works. (2 0 words & fig.)

1934 **621 .31 (.42**
Engineering, No. 3552, February 9, p. 143.
The Barking **generating station** of the County London Electric Supply Company, Ltd. (1 700 wor & fig.)

1934 **625 .13 (.42**
Engineering, No. 3553, February 16, p. 165.
The Mersey road **tunnel.** (2 700 words & fig.)

1934 **62. (01 & 6**
Engineering, No. 3553, February 16, p. 171.
JAKEMAN (C.). — The testing of **steam pipe** he insulating materials. (1 500 words & tables.)

1934 **621 .335 (.43) & 621 .43 (.43**
Engineering, No. 3553, February 16, p. 173.
The Berlin-Hambourg **high-speed Diesel-electric ra coach.** (3 000 words & fig.)

1934 313 : 621 .13
gineering, No. 3553, February 16, p. 198.
The engineering outlook. — VII. — The locomotive ustry. (1 000 words & tables.)

1934 624 .8 (.42)
gineering, No. 3554, February 23, p. 209.
Swing bridge across the River Weaver at Acton dge, Cheshire. (2 600 words & fig.)

1934 62. (01
gineering, No. 3554, February 23, p. 212.
CAPSELL (H. J.) & PROSSER (L. E.). — High-sitivity creep-testing equipment at the National ysical Laboratory. (3 800 words & fig.)

1934 621 .31 & 621 .89
gineering, No. 3554, February 23, p. 214.
VILLIAMS (A. E.). — The renovation of insulating . (2 900 words & fig.)

1934 656 .211.7 (.45)
gineering, No. 3554, February 23, p. 216.
Diesel-electric train-ferry « Scilla ». (1 500 words fig.)

1934 621 .115
gineering, No. 3554, February 23, p 242.
GUY (H. L.) & WINSTANLEY (E. V.). — Some tors in the design of surface condensing plant. — per read at the Annual Meeting of the Institution Mechanical Engineers, February 16, 1934. (5 400 rds & 1 table.)

1934 621 .9
gineering, No. 3554, February 23, p. 249.
Horizontal boring, milling, drilling and tapping ma-ne. (600 words.)

1934 624 .8 (.42)
gineering, No. 3555, March 2, p. 257.
Vertical-lift bridge over the Tees at Middlesbrough. 0 words & fig.)

1934 62. (064 (.42)
gineering, No. 3555, March 2, p. 258.
The British Industries Fair at Birmingham. — III. 500 words & fig.)

1934 621 .43 (.42)
gineering, No. 3555, March 2, p. 269.
ight rail-car for the London Midland & Scottish lway. (2 000 words & fig.)

1934 621 .335 (.44)
gineering, No. 3555, March 2, p. 277.
-6-4 type electric locomotive; Italian State Rail-'s. (800 words & fig.)

1934 693 (.42)
gineering, No. 3556, March 9, p. 300.
Fire protection of railway carriage sheds. (600 rds.)

1934 385. (01
Engineering, No. 3556, March 9, p. 305.
SPILLER (J. W.). — The respective merits of roads and railways for colonial development. (1 100 words.)

1934 625 .13 (.42)
Engineering, No. 3556, March 9, p. 311.
The Mersey road tunnel. (3 600 words & fig.)

1934 621 .9
Engineering, No. 3556, March 9, p. 316.
Precision finishing machine. (1 800 words & fig.)

1934 621 .133.7
Engineering, No. 3557, March 16, p. 331.
Automatic water-hardness tester. (800 words & fig.)

1934 669
Engineering, No. 3557, March 16, p. 331.
DE HAAS (W. J.) & HADFIELD (Sir Robert). — The effect of the temperature of liquid hydrogen (— 252.8 deg. C. on the tensile properties of metals. (3 800 words.)

1934 669 .1
The Metallurgist, Suppl. to the Engineer, March 2, 1934.
Oxygen and oxides in iron and steel. (2 200 words.)

1934 62. (01 & 669 .1
The Mettalurgist, p. 102. Suppl. to the Engineer, March 2.
Austenitic chrome-nickel steels. (2 000 words.)

1934 621 .88
The Metallurgist, p. 108. Suppl. to the Engineer,, March 2.
High strength light alloy rivets. (2 700 words.)

1934 62. (064 (.42)
The British Industries Fair at Birmingham. Supplement to Engineering, No. 3553, February 16, No. 3554, February 23. (36 000 words & fig.)

Engineering News-Record. (New York.)

1934 624 .32 (.73) & 624 .8 (.73)
Engineering News-Record, No. 4, January 25, p. 107.
Three new bridges for Cape Cod Canal. (2 000 words & fig.)

1934 624 .7 (.73)
Engineering News-Record, No. 4, January 25, p. 110.
LA MOTTE-GROVER. — Long continuous-girder bridge of concrete in Kansas. (1 000 words & fig.)

1934 656 .211.4 (.73)
Engineering News-Record, No. 4, January 25, p. 112.
Lakefront passenger terminal for Chicago railroads. (1 500 words & fig.)

1934 62. (01 & 693
Engineering News-Record, No. 4, January 25, p. 114.
PIERCE (S. C.) & McC. LARMOUR (H.). — Simple apparatus for testing cement characteristics. (2 100 words & fig.)

1934 **62. (01 & 721 .2**
Engineering News-Record, No. 5, February 1, p. 136.
TERZAGHI (K.). — Large retaining-wall tests. I — Pressure of dry sand. (2 800 words & fig.)

1934 **627 (.71)**
Engineering News-Record, No. 7, February 15, p. 219.
Pier construction in a 28-ft. tide. (4 600 words & fig.)

Great Western Railway Magazine. (London.)

1934 **656 .211 (.42), 656 .212 (.42) & 725 .3 (.42)**
Great Western Ry. Magazine, March, p. 121.
The Great Western Railway new station at Cardiff. (2 300 words & fig.)

Journal, Institution of Engineers, Australia. (Sydney, N. S. W.)

1934 **621 .392 (.946) & 624 (.946)**
Journal, Institut. Engineers, Australia, January, p. 3.
SHARP (R. Ch.). — Design and construction of an arc welded truss bridge at Kimberley, Tasmania. (6 600 words & fig.)

1934 **624 .7 (.946)**
Journal, Institut. Engineers, Australia, January, p. 10.
KNIGHT (A. W.). — The design and construction of composite slab and girder bridges. (9 000 words, tables & fig.)

London & North Eastern Railway Magazine. (London.)

1934 **651 (.42) & 656 .254 (.42)**
London & North Eastern Ry. Magazine, March, p. 134.
New automatic telephone exchange at York headquarters offices. (1 200 words & fig.)

Mechanical Engineering. (New York.)

1934 **536 & 697**
Mechanical Engineering, March, p. 144.
HOUGHTEN (F. C.). — Heat-transfer rates. (3 500 words & tables.)

1934 **62. (01**
Mechanical Engineering, March, p. 149.
McVETTY (P. G.). — Working stresses for high-temperature service. (3 200 words & fig.)

1934 **62. (01 & 669**
Mechanical Engineering, March, p. 155.
THOMASSEN (L.) & McCUTCHEON (D. M.). — X-ray determination of depth of cold working by machining. (1 200 words & fig.)

1934 **621 .132.8 (.43) & 621 .15 (.43)**
Mechanical Engineering, March, p. 164.
German steam automobiles. (2 700 words & fig.)

Modern Transport. (London.)

1934 **656 (.4**
Modern Transport, No. 778, February 10, p. 3.
Internal air services. Important centres to linked up this year. (1 900 words & fig.)

1934 **621 .335 (.492) & 621 .43 (.49**
Modern Transport, No. 778, February 10, p. 5.
Diesel-electric trains for Netherlands Railwa Streamlined articulated coaches of light weight main line services. (1 100 words & fig.)

1934 **651 (.42) & 656 .257 (.4**
Modern Transport. No. 778, February 10, p. 6.
Mechanical accounting on the L. M. S. R. — P punched cards in the Mineral Department. (1 700 wo & fig.)

1934 **625 .2**
Modern Transport, No. 778, February 10, p. 7.
GAUNT (W. H.). — Refrigerated transport. N methods on rail and road. (2 400 words.)

1934 **656 .254 (.4**
Modern Transport, No. 778, February 10, p. 8.
Automatic telephony on the L. N. E. R. (1 100 wo & fig.)

1934 **621 .43 (.7**
Modern Transport, No. 778, February 10, p. 9.
High-speed travel in the U. S. S. R. — Streamlir « ball-bearing » train. (1 000 words & fig.)

1934 **621**
Modern Transport, No. 778, February 10, p. 5.
SINCLAIR (G. F.). — Regeneration in electric tr tion as applied to trains, trams and trolley bu (2 000 words.)

1934 **656**
Modern Transport, No. 778, February 10, p. 6.
Industrial traffic management. — No. 37. — R way agreed charges. (1 100 words.)

1934 **656 .212.6 (.42) & 656 .1 (.4**
Modern Transport, No. 780, February 24, p. 3.
Mechanisation of rail goods depots. — Cart arrangements at Farringdon Street. (1 600 words fig.)

1934 **656 .23 & 6**
Modern Transport, No. 780, February 24, p. 5.
DAVIES (A.). — Commercial aspect of railway nagement. New methods on the L. M. S. Ry. (2 words.)

1934 **621**
Modern Transport, No. 780, February 24, p. 6.
Regeneration in electric traction. — Discussion Institute of Transport. (2 000 words.)

1934 **621 .43 (.**
Modern Transport, No. 780, February 24, p. 7.
Diesel-hydraulic railcar for L. M. S. Ry. (2 600 wo & fig.)

1934 **624 .8 (.42)**
odern Transport, No. 780, February 24, p. 8.
New bridge over the Tees. — Largest vertical lift idge in world. (2 300 words.)

1934 **621 .335 (.73) & 621 .43 (.73)**
odern Transport, No. 780, February 24, p. 9.
Light-weight high-speed trains in U. S. A. (2 400 ords & fig.)

1934 **388 (.42)**
odern Transport, No. 781, March 3, p. 3.
PICK (F.). — London Transport Board. — Some servations upon its functions and problems. (2 000 ords.)

1934 **621 .132.8 & 621 .43**
odern Transport, No. 781, March 3, p. 5.
TRITTON (J. S.). — Evolution of the modern rail-r. Comparative review of tendencies in design. (6 800 ords.)

1934 **656 (.42)**
odern Transport, No. 781, March 3, p. 11.
SPRIGG (T. S.). — Railways and aviation. (750 ords & fig.)

1934 **388 (.42)**
odern Transport, No. 782, March 10, p. 3.
ASHFIELD (Lord). — London Transport Board. — nancial, administrative and operating problems. 200 words.)

1934 **621 .43 (.42)**
odern Transport, No. 782, March 10, p. 5.
Pneumatic-tyred railcar. — The new « Micheline » odel. (1 000 words & fig.)

1934 **625 .143.2 (.42) & 625 .143.3 (.42)**
odern Transport, No. 782, March 10, p. 6.
CATCHPOLE (L. T.). — Increased life of rails. pecial steels and lubrication. (1 100 words & fig.)

1934 **656 .253**
odern Transport, No. 783, March 17, p. 3.
JENKIN JONES (C. M.). — Railway colour light gnalling. An operating point of view. (2 000 words.)

roceedings, American Society of Civil Engineers (New York.)

1934 **62 (01 & 624 .2**
roceed., Amer. Soc. Civil Eng., February, p. 185.
LYSE (F.) & GODFREY (H. J.). — Investigation of eb buckling in steel beams. (5 700 words & fig.)

Proceedings, Institution of Civil Engineers. (London.)

1933 **693 & 721 .2**
roceed., Institut. of Civil Eng., Vol. 234, p. 103.
JENKIN (C. F.). — The pressure on retaining-alls. (Paper and discussion.) (38 000 words, 56 cuts nd 1 table.)

1933 **621 .33 (.54)**
Proceed., Institut. of Civil Eng., Vol. 234, p. 225.
WHITE (B. G.). — The electrification of the Madras suburban section of the South Indian Railway. (Paper and discussion.) (20 000 words, 5 plates and 5 cuts.)

1933 **625 .13 (.42) & 693 (.42)**
Proceed., Institut. of Civil Eng., Vol. 234, p. 277.
CARPMAEL (R.). — Cementation in the Severn tunnel. (Paper and discussion.) (14 000 words & 1 plate.)

1933 **627 (.42) & 656 .213 (.42)**
Proceed., Institut. of Civil Eng., Vol 234, p. 312.
DEANE (H. J.). — The Jetty Works of the Ford Motor Company at Dagenham. (Paper and discussion.) (18 500 words, 5 cuts and 1 plate.)

1933 **624 .2**
Proceed. Institut. of Civil Eng., Vol. 234, p. 358.
INGLIS (C. E.). — Impact in railway-bridges. (Paper and discussion.) (26 000 words & 22 cuts.)

1933 **62. (01 & 669**
Proceed., Institut. of Civil Eng., Vol. 234, p. 445.
EVANS (U. R.). — Some aspects of the corrosion problem. (19 000 words, 1 plate and 3 cuts.)

1934 **627**
Institut. of Civil Engineers, Selected engineering papers, No. 121.
MUIRHEAD (W.). — The stabilizing of a quay-wall. (4 000 words & fig.)

1934 **627 (.54)**
Institut. of Civil Engineers, Selected engineering papers, No. 122.
ASH (W. C.). — An experiment on quay-walls at King George's dock, Calcutta. (3 900 words & fig.)

1934 **624 .8 (.42) & 625 .13 (.42)**
Institut. of Civil Engineers, Selected engineering papers, No. 123.
PAUL (A. A.). — Repairs to a rolling lift bridge over the River Lee at Cork. (3 000 words & fig.)

1934 **627**
Institut. of Civil Engineers, Selected engineering papers, No. 125.
CHATLEY (H.). — Energy considerations in dredging. (5 500 words.)

1934 **62. (01 & 669 .1**
Institut. of Civil Engineers, Selected engineering papers, No. 128.
ORR (J.). — The torsional properties of structural and other sections. (6 200 words & fig.)

1934 **624. (0, 624 .9 & 721 .9**
Institut. of Civil Engineers, Selected engineering papers, No. 131.
BAKER (J. F.). — The mechanical and mathematical stress analyses of steel building frames. (9 500 words & fig.)

1934 **536, 62. (01 & 621 .111**
Institut. of Civil Engineers, Selected engineering papers, No. 133.
COCKS (E. B.). — **The graphical determination of expansion thrusts and stresses in steam pipes.** (18 000 words & fig.)

1934 **656 .212.6 & 656 .213**
Institut. of Civil Engineers, Vernon-Harcourt lecture, 1931-32.
GEDYE (N. G.). — **The mechanical handling of coal at ports.** (20 000 words, 6 tables & fig.)

Railway Age. (New York.)

1934 **385 .113 (.73)**
Railway Age, No. 4, January 27, p. 97.
PARMELEE (Dr. J. H.). — **A review of railway operations in 1933.** (9 500 words & fig.)

1934 **656 .23 (.73)**
Railway Age, No. 4, January 27, p. 105.
DOSTER (R. A.) & EMERY (J. C.). — **Railroads concentrate on traffic recovery.** (2 600 words & fig.)

1934 **385 .3 (.73)**
Railway Age, No. 4, January 27, p. 108.
LANE (H. F.). — **Co-ordinator Eastman's comprehensive investigation.** (5 600 words.)

1934 **385 .1 (.73)**
Railway Age, No. 4, January 27, p. 113.
LANE (H. F.). — **« More perfect union » urged by Mr. Eastman.** (10 000 words.)

1934 **385 .1 (.71)**
Railway Age, No. 4, January 27, p.
LYNE (J. G.). — **Canadian Railways « co-ordinating ».** (2 500 words & fig.)

1934 **385 .113 (.72)**
Railway Age, No. 4, January 27, p. 123.
PROCEL (N.). — **Mexican Railways make better showing.** (2 500 words & fig.)

1934 **385 .113 (.71 + .73)**
Railway Age, No. 4, January 27, p. 126.
LYNE (J. G.). — **1933 in railway finance.** (2 900 words, 7 tables & fig.)

1934 **385 .1 (.73)**
Railway Age, No. 4, January 27, p. 131.
LANE (H. F.). — **Public Works Administration loans for maintenance and equipment.** (2 200 words.)

1934 **313 : 625 .1 (.71 + .73)**
Railway Age, No. 4, January 27, p. 133.
BOYD (G. E.). — **Railway construction** reaches lowest point since civil war. (6 900 words, tables & fig.)

1934 **313 : 625 .17 (.71 + .73)**
Railway Age, No. 4, January 27, p. 139.
Another year of **undermaintenance.** (3 400 words, tables & fig.)

1934 **313 : 621 .139 (.73), 313 : 625 .18 (.73 & 313 : 625 .27 (.73**
Railway Age, No. 4, January 27, p. 144.
STEEL (D. A.). — **Railway material costs advance** in 1933. (4 000 words, tables & fig.)

1934 **313 : 656 .25 (.71 + .73**
Railway Age, No. 4, January 27, p. 150.
DUNN (J. H.). — **Signaling construction durin** 1933. (1 800 words, tables & fig.)

1934 **313 : 621 .13 (.71 + .73**
Railway Age, No. 4, January 27, p. 155.
TAFT (W. J.). — **Locomotives ordered in 1933.** (1 00 words & tables.)

1934 **313 : 625 .23 (.71 + .73**
Railway Age, No. 4, January 27, p. 157.
KRAEGER (F. W.). — **Passenger car orders in 193** (600 words & fig.)

1934 **313 : 625 .24 (.71 + .73**
Railway Age, No. 4, January 27, p. 159.
KRAEGER (F. W.). — **Freight cars ordered in 193** (1 000 words & table.)

1934 **313 : 656 .1 (.71 + .73**
Railway Age, No. 4, January 27, p. 162.
EMERY (J. C.). — **Railways extend highway servic** (1 300 words & 1 table.)

1934 **313 : 656 .254 (.71 + .73**
Railway Age, No. 4, January 27, p. 164.
HAMILTON (S. R.). — **Decline in communicatio activities is checked** (1 600 words & tables.)

1934 **313 : 621 .43 (.71 + .73**
Railway Age, No. 4, January 27, p. 72.
PECK (C. B.). — **Character of rail motor cars chan** ed in 1933. (600 words & tables.)

1934 **621 .43 (.73**
Railway Age, No. 5, February 3, p. 184.
Union Pacific installs **light-weight high-speed passe** ger train. (9 000 words & fig.)

1934 **656 .23 (.73**
Railway Age, No. 5, February 3, p. 198.
Traffic development series. Article No. 18. — **Ca the railways improve their freight solicitation methods** (2 400 words & fig.)

1934 **625 .142.2 (.73) & 691 (.73**
Railway Age, No. 5, February 3, p. 201.
Wood-Preservers' Association meet at Houston. (4 20 words.)

1934 **385 .3 (08 (.73) & 656 .25 (.73**
Railway Age, No. 5. February 3, p. 207.
Annal report of Bureau of Safety (U. S. A.). (90 words.)

1934 **624 .1 (.73) & 625 .13 (.73**
Railway Age, No. 6, February 10, p. 220.
Bates (F. E.). — **Use three-pile concrete bents i railway trestles.** (1 900 words & fig.)

1934 62. (01 & 625 .246
ilway Age, No. 6, February 10, p. 223.
Effect of sulphur on aluminium cars. (800 words &
.)

1934 659 (.73)
ilway Age, No. 7, February 17, p. 250.
Should railway freight service be advertised ? (3 000
rds & fig.)

1934 625 .151 (.73) & 656 .254 (.73)
ilway Age, No. 7, February 17, p. 255.
Centralized traffic control replaces staff system on
and Trunk Western. (1 800 words & fig.)

1934 621 .335 (.73) & 621 .338 (.73)
ilway Age, No. 7, February 17, p. 259.
Motor cars and trailers for the Pennsylvania electri-
ation. (3 100 words & fig.)

1934 625 .142.2 (.73) & 691 (.73)
ilway Age, No. 7, February 17, p. 263.
JACKSON (W. E.). — Air-seasoning of wood for
servative treatment. (3 200 words & fig.)

1934 624. (0 (.73)
ilway Age, No. 8, February 24, p. 281.
HARTMANN (E. C.). — Introduce new high strength
uctural aluminum alloy. (1 600 words & fig.)

1934 656 .211.5 (.73)
ilway Age, No. 8, February 24, p. 283.
Should the City ticket office be abandoned ? (2 800
rds & fig.)

1934 385. (0
ilway Age, No. 8, February 24, p. 287.
DUNN (S. O.). — Prospects and problems of the
lway supply and equipment industry. (3 800 words
ig.)

1934 656 .254 (.73)
lway Age, No. 8, February 24, p. 291.
LANE (W. F.). — Remote control on the Burlington.
0 words & fig.)

1934 625 .142.2 (.73) & 691 (.73)
lway Age. No. 8. February 24, p. 293.
American Wood Preservers' Association writes rules
storing lumber. (1 200 words & fig.)

1934 656 .1 (.73)
lway Age. No. 8, February 24, p. 295.
Bus service co-ordinated by Reading and Pennsylva-
. (1 700 words & fig.)

1934 656 .23 & 659
lway Age, No. 9, March 3, p. 313.
Competition can be overcome! — Improved passenger
freight service, adjusted rates and stronger selling
thods will restore much lost traffic to railways.
00 words & fig.)

1934 625 .215 (.73)
Railway Age, No. 9, March 3, p. 317.
Truck eliminates harmonic spring oscillations. (2 000
words & fig.)

Railway Engineer. (London.)

1934 625 .143.2 & 625 .143.3
Railway Engineer, March, p. 67.
The rail of the future (1 400 words.)

1934 621 .392 (.43) & 625 .246 (.43)
Railway Engineer, March, p. 70.
BONDY (O.). — Welded goods wagons in Germany.
(1 300 words & fig.)

1934 625 .172 (.43)
Railway Engineer, March, p. 72.
Measuring relative levels of rails under load at
speed. (400 words & fig.)

1934 624 .32 (.54)
Railway Engineer, March, p. 73.
CRUICKSHANK (W. D. McD.). — The Indus bridge
at Kalabagh, North Western Ry, India. (3 300 words
& fig.)

1934 625 .1 (.42) & 656 .253 (.42)
Railway Engineer, March, p. 81.
Gidea Park-Shenfield widening, L. N. E. R. (1 300
words & fig.)

1934 621 .94 (.42)
Railway Engineer, March, p. 85.
The Herbert patent preoptive headstock. (700 words
& fig.)

1934 625 .122 (.44)
Railway Engineer, March, p. 86.
Re-making and blanketting clay formations under
main lines in service. (900 words & fig.)

1934 624 (.43)
Railway Engineer, March, p. 88.
Steel bridges on the Kiel canal. (500 words & fig.)

1934 621 .134.3 (.42)
Railway Engineer, March, p. 90.
Atlantic type locomotive fitted with poppet valve
mechanism, L. N. E. R. (400 words & fig.)

1934 625 .142.2 & 625 .142.3
Railway Engineer, March, p. 91.
ALLEN (C. J.).— Evolution of wear-resisting rails.
(2 100 words & fig.)

1934 621 .335 (.43) & 621 .43 (.43)
Railway Engineer, March, p. 96.
Petrol-electric loco-tractors. (1 400 words & fig.)

1934 621 .132.3 (.42)
Railway Engineer, March, p. 98.
High-speed steam locomotives for Germany. (1 000
words & fig.)

Railway Engineering and Maintenance. (New York.)

1934 **625 .144.4 (.73)**
Railway Engineering & Maintenance, February, p. 66.
Power equipment used in taking abandoned line. (1 300 words & fig.)

1934 **625 .122 (.73)**
Railway Engineering & Maintenance, February, p. 72.
Adequate **drainage** proves a boon to economical track maintenance. (3 200 words & fig.)

1934 **665 .882 (.73)**
Railway Engineering & Maintenance, February, p. 76.
High pressure bottled gas for riveting. (1 200 words.)

1934 **625 .113**
Railway Engineering & Maintenance, February, p. 77.
WALKER (Th.). — **Simplifying spiral work in string lining.** (1 200 words & fig.)

1934 **625 .142.2 (.73) & 691 (.73)**
Railway Engineering & Maintenance, February, p. 79.
American Wood Preservers' Association discuss **railway problems.** (3 800 words & 2 tables.)

Railway Gazette. (London.)

1934 **656 .257 (.42) & 651 (.42)**
Railway Gazette, No. 6, February 9, p. 210.
Mineral Department **accountancy mechanisation,** L. M. S. R. (1 800 words & fig.)

1934 **625 .212**
Railway Gazette, No. 6, February 9, p. 212.
Smooth running bogies. (800 words & fig.)

1934 **621 .132.5 (.54)**
Railway Gazette, No. 6, February 9, p. 214.
Metre gauge **2-8-0 locomotives** for India. (600 words & fig.)

1934 **656 .254 (.42)**
Railway Gazette, No. 6, February 9, p. 220.
New **automatic telephone exchange** at York, L. N. E. R. (1 350 words & fig.)

1934 **656 .251 (.42)**
Railway Gazette, No. 7, February 16, p. 258.
3 and 4-aspect colour light signals (L. N. E. R.). (400 words & fig.)

1934 **625 .143.2 (.73)**
Railway Gazette, No. 7, February 16, p. 258.
U. S. A. **rail specification and classification.** (800 words.)

1934 **656 .257**
Railway Gazette, No. 7, February 16, p. 261.
The history of the **mechanical locking frame.** (2 700 words.)

1934 **621 .**
Railway Gazette, No. 7, February 16, p. 267.
The Karrier **road-rail vehicle.** (250 words & fig.)

1934 **656 .254 (.49**
Railway Gazette, No. 7, February 16, p. 269.
Automatic train control in Switzerland. (900 wor & fig.)

1934 **625 .143.2 (.4**
Railway Gazette, No. 7, February 16, p. 271.
Regulated **sorbitic treatment of rails.** (500 wor & fig.)

1934 **725 .23 (.4**
Railway Gazette, No. 7, February 16, p. 274.
« **Euston House** », L. M. S. R. (4 300 words & fi

1934 **693 (.4**
Railway Gazette, No. 8, February 23, p. 296.
Protection of railway property from fire. (1 9 words & fig.)

1934 **621 .134.3 (.4**
Railway Gazette, No. 8, February 23, p. 299.
Atlantic type locomotive fitted with poppet va mechanism, L. N. E. R. (400 words & fig.)

1934 **621 .392 (.4**
Railway Gazette, No. 8, February 23, p. 301.
A portable Diesel welding plant. (500 words & fi

1934 **614 .8 (.43) & 656 .28 (.4**
Railway Gazette, No. 8, February 23, p. 302.
Safety trains in Germany. (300 words & fig.)

1934 **625 .235 (.42) & 694 (.4**
Railway Gazette, No. 8, February 23, p. 306.
Timber in rolling stock construction. (1 100 wo & fig.)

1934 **529 (.42) & 656 .211.5 (.4**
Railway Gazette, No. 9, March 2, p. 345.
Synchronised clocks at Paddington, G. W. R. (& fig.)

1934 **656 .253 (.4**
Railway Gazette. No. 9, March 2, p. 347.
Up-to-date **signalling** in Northern Ireland. (2 words & fig.)

1934 **621 .132.3 (.44) & 621 .134.4 (.4**
Railway Gazette, No. 9, March 2, p. 351.
French compound locomotive converted to simp (300 words, 1 table & fig.)

1934 **625 .234 (.4**
Railway Gazette, No. 9, March 2, p. 353.
An efficient **ventilator.** (250 words & fig.)

1934 **385. (08 (.4**
Railway Gazette. No. 9, March 2, p. 360.
London Midland & Scottish Railway. — **Ann General Meeting.** (11 000 words.)

1934 **385. (08 (.42)**
lway Gazette, No. 9, March 2, p. 369.
reat Western Railway Company. — **Annual eral Meeting.** (11 000 words.)

1934 **385 (.08 (.42)**
lway Gazette, No. 9, March 2, p. 377.
reat Northern Railway (Ireland). — **Annual eral Meeting.** (1 500 words.)

1934 **625 .174 (.43)**
lway Gazette, No. 10, March 10, p. 397.
ovel German **snow ploughs.** (2 400 words & fig.)

1934 **385 (.08 (.42)**
lway Gazette, No. 10 March 10, p. 408.
outhern Railway Company. — **Annual General eting.** (7 500 words.)

1934 **385. (08 (.42)**
lway Gazette. No. 10, March 10, p. 414.
ondon & North Eastern Railway Company. — **nual General Meeting.** (4 800 words.)

1934 **385 .113 (.42)**
lway Gazette. No. 10, March 10, p. 417.
he L. N. E. Railway in 1933. (4 400 words.)

1934 **656 .212.6 (.42) & 656 .1 (.42)**
lway Gazette, No. 11, March 16, p. 457.
A mechanised city goods station. (1 300 words & fig.)

1934 **621 .43 & 656 .25**
lway Gazette. No. 11, March 16, p. 461.
Automatic standby equipment. (1 900 words & fig.)

1934 **621 .43 (.43)**
ilway Gazette. No. 11, March 16, p. 464.
Light locomotives on the German State Rys. (1 200 rds & fig.)

1934
sel Railway Traction. p. 318. Supplt. to the Railw. Gazette, February 23.
Three-power locomotives. (3 400 words & fig.)

1934 **621 .43 (.42)**
sel Railway Traction. p. 324, Supplt. to the Railw. Gazette, February 23.
Light Diesel railcars for the L. M. S. Ry. (1 200 rds & fig.)

1934 **621 .43**
sel Railway Traction, p. 327, Supplt. to the Railw. Gazette, February 23.
A successful hydraulic drive. (2 300 words & fig.)

1934 **621 .43**
sel Railway Traction, p. 330, Supplt. to the Railw. Gazette, February 23.
A new type of fluid clutch. (600 words & fig.)

1934 **621 .43 (.485)**
sel Railway Traction, p. 332, Supplt. to the Railw. Gazette, February 23.
Ten years of railway Diesel engine building. (1 300 rds & fig.)

1934 **621 .43 (.47)**
Diesel Railway Traction, p. 334, Supplt. to the Railw. Gazette, February 23.
Heavy geared shunting locomotive. (600 words & fig.)

1934 **621 .33 (.68)**
Electric Railway Traction, p. 232, Supplt. to the Railw. Gazette, February 9.
South African Railways **electrification.** (3 500 words & fig.)

1934 **621 .336**
Electric Railway Traction, p. 237, Supplt. to the Railw. Gazette, February 9.
WHYMAN (F.). — **Pantograph current collection.** (3 200 words.)

1934 **621 .33 (.43) & 625 .4 (.43)**
Electric Railway Traction, p. 242, Supplt. to the Railw. Gazette, February 9.
KOFFMAN (J. L.). — Barmen-Elberfeld **suspended monorail electric railway.** (1 000 words & fig..)

1934 **621 .31**
Electric Railway Traction, p. 244, Supplt. to the Railw. Gazette, February 9.
Mercury-arc rectifiers. (1 300 words & fig.)

1934 **621 .33 (.45)**
Electric Railway Traction, p. 245, Supplt. to the Railw. Gazette, February 9.
Rome-Viterbo railway. (1 100 words & fig.)

1934 **621 .33 (.42)**
Electric Railway Traction, p. 430, Supplt. to the Railw. Gazette, March 9.
DAWSON (Sir Philip). — **Railway electrification** in Britain. (1 400 words & fig.)

1934 **621 .33**
Electric Railway Traction, p. 432, Supplt. to the Railw. Gazette, March 9.
CROFT (E. H.). — **Electric train movement and energy consumption.** (3 100 words & fig.)

1934 **621 .337**
Electric Railway Traction, p. 436, Supplt. to the Railw. Gazette, March 9.
FAIRBURN (C. E.). — Layout of **control equipment** (Letter to the Editor). (1 000 words & fig.)

1934 **621 .33**
Electric Railway Traction, p. 438, Supplt. to the Railw. Gazette, March 9.
Regeneration on electric railways. (2 300 words & fig.)

1934 **621 .335 (.489)**
Electric Railway Traction, p. 441, Supplt. to the Railw. Gazette, March 9.
Trial runs on Danish State Railways. (500 words & fig.)

1934 **621 .331**
Electric Railway Traction, p. 442, Supplt. to the Railw. Gazette, March 9.
Mercury arc rectifiers. (2 100 words & fig.)

Railway Magazine. (London.)

1934 **656 .222.1 (.44)**
Railway Magazine, March, p. 157.
Modern locomotive work in France. I. — Chemins de fer Paris-Orléans-Midi. (2 800 words, tables & fig.)

1934 **656 .222.1 (.42)**
Railway Magazine, March, p. 166.
ALLEN (C. J.). — **British locomotive practice & performance.** (4 900 words & fig.)

Railway Mechanical Engineer.

1933 **621 .43 (.73)**
Railway Mechanical Engineer, December, p. 419.
ADAMS (E. E.). — Union Pacific **light-weight high-speed train.** (4 800 words & fig.)

1933 **621 .133.2 (.73)**
Railway Mechanical Engineer, December, p. 426.
Union Pacific tests firebar grates. (2 300 words & fig.)

1933 **621 .131.2**
Railway Mechanical Engineer, December, p. 429.
VINCENT (H. S.). — **Ratios of modern locomotives.** (2 600 words, tables & fig.)

1933 **621 .133.1 (.73)**
Railway Mechanical Engineer, December, p. 435.
Thermalizing speeds pulverized-coal combustion. (2 200 words & fig.)

1934 **621 .118 (.73) & 621 .13 (.73)**
Railway Mechanical Engineer, February, p. 39.
Annual report of the Bureau of Locomotive Inspection. (750 words & fig.)

1934 **621 .133.5**
Railway Mechanical Engineer, February, p. 41.
The locomotive **smoke nuisance.** (1 600 words.)

1934 **621 .135. (01**
Railway Mechanical Engineer, February, p. 42.
FRY (L. H.). — **Locomotive counterbalancing.** (5 300 words & fig.)

1934 **313 : 625 .234 (.73)**
Railway Mechanical Engineer, February, p. 48.
Air-conditioned passenger cars in service in the United States, December 31, 1933. (Tables.)

1934 **62. (01, 621 .392 & 721 .9**
Railway Mechanical Engineer, February, p. 50.
CHAPMAN (E.). — **Stresses in welded structures.** (2 700 words & fig.)

Railway Signaling. (Chicago.)

1934 **656 .256.2 (.**
Railway Signaling, February, p. 69.
COLES (J. R.). — **All-relay interlocking** on Western Pacific. (1 400 words & fig.)

1934 **656 .**
Railway Signaling, February, p. 71.
ANDERSON (G. B.) & MOORE (E.). — **Vacu tube control of alternating current track circuits.** (1 words & fig.)

1934 **625 .162 (.73) & 656 .254 (.**
Railway Signaling, February, p. 73.
BRADLEY (E. E.). — **Crossing signals** on West Maryland. (1 000 words & fig.)

1934 **625 .151 (.73) & 656 .254 (.**
Railway Signaling, February, p. 75.
Centralized traffic control replaces staff on Gr Trunk Western. (2 700 words & fig.)

1934 **656 .257 (.**
Railway Signaling, February, p. 78.
TATTERSALL (A. E.). — **Re-signalling** the Lon & North Eastern Ry. of England. (4 200 words & fi

1934 **656 .259 (.**
Railway Signaling, February, p. 83.
Trainmen control **highway-crossing signals** on El Joliet & Eastern. (1 000 words & fig.)

1934 **656 .254 (.**
Railway Signaling, February, p. 85.
Centralized traffic control replaces staff on M waukee. (1 900 words & fig.)

The Locomotive. (London.)

1934 **621 .132.3 (.42) & 621 .132.5 (.4**
The Locomotive, February 15, p. 32.
New **2-6-0 locomotives** L. M. & S. Ry. (1 100 wo & fig.)

1934 **621 .132.5 (.4**
The Locomotive, February 15, p. 33.
New **ten-coupled compound locomotives,** Northe Ry. of France. (1 500 words & fig.)

1934 **621 .43 (.4**
The Locomotive, February 15, p. 44.
« **Hunslet** » **oil-engined locomotives** for the L. & S. Ry. (1 300 words & fig.)

1934 **621 .13**
The Locomotive, February 15, p. 47.
PHILLIPSON (E. A.). — **Steam locomotive desig** Data and formulæ — Valve gears. Poppet valv (1 700 words, 1 table & fig.)

1934 **656 .255 & 656 .2**
The Locomotive, February 15, p. 55.
Centralised traffic control. (2 000 words & fig.)

1934 625 .245 (.42)
e Locomotive, February 15, p. 60.
The Welchman **convertible wagon.** (800 words & fig.)

1934 625 .616
e Locomotive, No. 499, March 15, p. 67.
Small power locomotives for narrow gauge railys. (2 600 words & fig.)

1934 621 .43 (.42)
e Locomotive, No. 499, March 15, p. 76.
Diesel-hydraulic railcar for L. M. S. Ry. (2 700 words fig.)

1934 621 .132.8 & 621 .43
e Locomotive, No. 499, March 15, p. 80.
TRITTON (J. S.). — **Rail cars.** — Paper read at the stitution of Locomotive Engineers. (2 300 words.)

1934 625 .232 (.68)
e Locomotive, No. 499, March 15, p. 93.
Twin dinings cars, « Protea », South African Rys. 400 words & fig.)

In Spanish.

Anales de la Asociación de Antiguos Alumnos del I. C. A. I. (Madrid.)

1934 621 .335 (.460)
ales de la Asociación de Antiguos Alumnos, febrero, p. 103.
JACKSON (L.) & LLANOS (S.). — **Locomotoras ctricas** de la Compañia de los Caminos de Hierro l Norte de España. (2 700 palabras & fig.) (Continará.)

Caminos de hierro. (Madrid.)

1934 385
minos de hierro, febrero, p. 40.
MONREAL (M.) & CASTILLO (M.). — Consideraones sobre la **crisis ferroviaria** y sus posibles remeos. (2 000 palabras & fig.)

Ferrocarriles y Tranvias. (Madrid.)

1934 656 .1 & 656 .2
errocarriles y Tranvias, febrero, p. 95.
BARCELÓ (J.). — La **competencia entre el ferrorril y el automóvil.** Reglamentación o libertad de ansporte ? (2 900 palabras.)

1934 656 .2 (.460)
errocarriles y Tranvias, febrero, p. 98.
REPARAZ (F.). — La **ordenación ferroviaria,** tarea ndiente. (1 700 palabras & fig.)

Ingenieria y Construcción. (Madrid.)

1934 621 .33
Ingenieria y Construcción, marzo, p. 113.
CUERVO (L. S.). — La **electrificación** de ferrocarriles como elemento de reconstrucción nacional. (4 400 palabras & fig.)

1934 621 .33 (.460)
Ingenieria y Construcción, marzo, p. 117.
DE COS (F.). — El porvenir de las **electrificaciones** de ferrocarriles en España. (3 100 palabras & fig.)

1934 621 .33 (.460)
Ingenieria y Construcción, marzo, p. 121.
VIANI (M.). — La **explotación económica de los ferrocarriles.** Resultados conseguidos en las secciones electrificadas de la Compañia del Norte. (6 000 palabras, 12 cuadros & fig.)

1934 621 .33
Ingenieria y Construcción, marzo, p. 137.
VELASCO (A. M. de). — Suministro de energia a las **electrificaciones** del Norte. (5 500 palabras & fig.)

1934 621 .13, 621 .33 & 621 .43
Ingenieria y Construcción, marzo, p. 149.
GIBERT y SALINAS (A.). — **Del vapor a la electricidad,** pasando por el Diesel. (7 500 palabras & fig.)

1934 621 .33
Ingenieria y Construcción, marzo, p. 158.
CHAPULI (J. R.). — A propósito de una campaña contra la **electrificación** de los ferrocarriles. (3 100 palabras.)

1934 625 .2
Ingenieria y Construcción, marzo, p. 173.
DORDA (J. V. de). — El **aligeramiento** en los vehiculos para el transporte ferroviario. (2 600 palabras & fig.)

1934 621 .332
Ingenieria y Construcción, marzo, p. 173.
SERRET (R. M.). — **Linea de contacto** y subcentrales transformadoras. (3 100 palabras & fig.)

1934 621 .33 (.42)
Ingenieria y Construcción, marzo, p. 188.
NAVARRETE (J. M.). — La **tracción eléctrica** en Gran Bretaña. (3 000 palabras, 1 mapa & fig.)

1934 621 .33 (.44)
Ingenieria y Construcción, marzo, p. 192.
GRANELL (J.). — **Electrificación** de los ferrocarriles en Francia. (2 100 palabras & fig.)

1934 621 .33 (.485)
Ingenieria y Construcción, marzo, p. 196.
MOLINA (M. R. G.). — Datos sobre la **electrificación** de los ferrocarriles suecos. (2 500 palabras, 5 cuadros & fig.)

1934 621 .33 (.43)
Ingenieria y Construcción, marzo, p. 201.
La **electrificación** de la línea Augsburgo-Stuttgart. (1 900 palabras & fig.)

1934 **621 .335**
Ingenieria y Construcción, marzo, p. 205.
VERA (R. P. de). — Sobre la elección de **locomotoras para ferrocarriles eléctricos.** (2 200 palabras & fig.)

1934 **621 .335**
Ingenieria y Construcción, marzo, p. 207.
WIRTZ (M.). — **Locomotoras** éléctricas de gran velocidad. (2 200 palabras & fig.)

1934 **621 .33 (.439)**
Ingenieria y Construcción, marzo, p. 211.
RIESTZ (E.). — La **electrificación** de la línea Budapest-Hegyeshalom (Hungria). (1 200 palabras & fig.)

1934 **621 .33 (.52)**
Ingenieria y Construcción, marzo, p. 213.
Los **ferrocarriles electrificados** en el Japón. (700 palabras & fig.)

1934 **621 .33 (.4)**
Ingenieria y Construcción, marzo, p. 216.
Resultados económicos de las principales **electrificaciones** europeas. (2 100 palabras & fig.)

1934 **621 .33 (.3)**
Ingenieria y Construcción, marzo, p. 218.
Estado actual de las **electrificaciones ferroviarias** en todo el mundo. (1 000 palabras.)

Los Transportes. (Madrid.)

1934 **656 .2**
Los Transportes, nº 370, 15 febrero, p. 50.
MERINO (J.). — **Teorética del tráfico.** (1 600 palabras & fig.)

1934 **625 .245 & 656 .225**
Los Transportes, nº 371, 1 marzo, p. 67.
La unidad del transporte realizada por el « **container** ». (1 200 palabras & fig.)

Revista de Ingenieria Industrial. (Madrid.)

1934 **625 .213**
Revista de Ingenieria industrial, nº 45, febrero, p. 40.
LAFITTE (C.). — El funcionamiento de la **suspensión de vehículos.** (3 400 palabras & fig.)

Revista del Consejo Administrativo de los Ferrocarriles Nacionales de la República de Colombia. (Bogotá.)

1934 **656 .1 (.7 + .8) & 656 .2 (.7 + .8)**
Revista del C. Adᵒⁿ de los FF. CC. Nac. de la Repúbl. de Colombia, enero, p. 20.
Los ferrocarriles americanos ante la **competencia de las carreteras.** (9 200 palabras & fig.)

Revista de Obras Públicas. (Madrid.)

1934 **6**
Revista de Obras Publicas, nº 5, 1º de marzo, p. 81.
CASADO (C. F.). — Colección de **puentes de altu estricta.** (1 100 palabras & fig.)

In Italian.

La tecnica profesionale. (Firenze.)

1934 **621 .13**
La tecnica profesionale, marzo, p. 65.
La confezione delle **guarniture metalliche** per le a degli stantuffi e dei distributori. (1 100 parole & fi

1934 **621 .13**
La tecnica profesionale, marzo, p. 78.
MICHELUCCI (A.). — Criteri per giudicare se acqua è idonea per l'**alimentazione delle locomoti** (2 700 parole.)

L'Ingegnere. (Roma.)

1934 **621 .39 & 6**
L'Ingegnere, nº 4, 16 febbraio, p. 154.
MASI (F.). — Forme costruttive dei **sistemi salda** (3 200 parole & fig.)

1934 **624 .32 (.4**
L'Ingegnere, nº 5, 1 marzo, p. 215.
TRILLO (S.).— Il nuovo **ponte d'acciaio** sul Bre per l'autostrada Venezia-Padova. (2 000 parole & fi

Rivista tecnica delle ferrovie italiane. (Roma

1934 **621 .33 (.45) & 621 .335 (.4**
Rivista tecnica delle ferrovie italiane, 15 febbraio, p.
CARLI (C.). — Sviluppo e miglioramenti del ser zio della **trazione sulla rete elettrificata.** (4 900 par & fig.)

1934 **625 .1 (.4**
Rivista tecnica delle ferrovie italiane, 15 febbraio, p.
Ferrovia Piacenza-Cremona. (1 600 parole & fig.)

Trasporti e lavori pubblici. (Roma.)

1934 **385. (01 (.66) & 656 .1 (.6**
Trasporti e lavori pubblici, gennaio, p. 22.
SPINELLI (O.). — **Esperienze coloniali italia** Ferrovie e autolinee in Somalia. (2 000 parole).

1934 **656 (.4**
Trasporti e lavori pubblici, gennaio, p. 27.
ZANETTE (C.). — I **trasporti** nell' ordinam corporativo. (3 200 parole.)

In Dutch.

De Ingenieur. (Den Haag.)

1934 **691**

Ingenieur, n° 9, 2 Maart, p. Bt. 19.

EMPERGER (F.). — Zur Vereinheitlichung der **rechnung des Eisenbetons.** (2 500 woorden & fig.)

1934 **62. (01 & 691**

Ingenieur, n° 9, 2 Maart, p. Bt. 22.

RENGERS (N. J.). — Proefnemingen op kolommen **n beton en gewapend beton.** (1 200 woorden & fig.)

1934 **624**

Ingenieur, n° 10, 9 Maart, p. A89.

Gewapend beton en **ijzer** in den bruggenbouw. (2 100 **orden** & fig.)

Spoor- en Tramwegen. (Utrecht.)

1934 **625 .1 (.92)**

oor en Tramwegen, n° 5, 27 Februari, p. 110.

ELLERBROECK (M.). — De **aanleg van de spoorlijn** hat-Loeboeklinggau (Zuid-Sumatra). (2 000 woorden fig.)

1934 **656 .231 (.492)**

oor en Tramwegen, n° 6, 13 Maart, p. 131.

JAGT (A. G.). — Is de critiek op de door de Neder**dsche** Spoorwegen gedane stappen ter verkrijging **n** meer **tariefvrijheid** wel gemotiveerd ? (2 200 woor**n.**)

1934 **621 .132.8 (.43)**

Spoor en Tramwegen, n° 6, 13 Maart, p. 133.

De **stoomlocomotief** in het snelverkeer. (1 200 woorden & fig.)

In Portuguese.

Boletim do Instituto de Engenharia (S. Paulo). (Brasil.)

1934 **656 .1 & 656 .2**

Boletim do Instituto de Engenharia, janeiro, p. 3.

RICARDO (G.) Junior. — Relações entre os **transportes ferroviarios e rodoviarios.** (7 200 palavras.)

1934 **656 .1 & 656 .2**

Boletim do Instituto de Engenharia, janeiro, p. 28.

GUMERCINDO PENTEADO. — Ha **desigualdade de tratamento de poder publico** em relação ás estradas de ferro e de rodagem ? (2 700 palavras & 1 quadro.)

Gazeta dos caminhos de ferro. (Lisboa.)

1934 **385. (01 (.67)**

Gazeta dos caminhos de ferro, n° 1108, 16 de fevereiro, p. 109.

AZEREDO DE SA FERNANDES (L.). — O **prolongamento** do Caminho de ferro de Malange. (1 500 palavras & fig.)

M. Weissenbruch Co., Ltd., Printer of the King, 49, rue du Poinçon, Bruxelles.

MONTHLY BIBLIOGRAPHY OF RAILWAYS [1].

PUBLISHED UNDER THE SUPERVISION OF

P. GHILAIN,

General Secretary of the Permanent Commission of the International Railway Congress Association.

JUNE (1934)

[016. 385. (02]

I. — BOOKS.

In French.

1934 62. (06 (.44)

Annuaire de 1934 et partie formant complément à nnuaire décennal publié en 1930, de la Société des génieurs civils de France.

Paris. Hôtel de la Société, 19, rue Blanche. 1 volume, 4 pages.

1934 313 .385 (.438)

Annuaire statistique des Chemins de fer de l'Etat lonais pour l'exercice 1932.

Warszawa, Ministère des Communications. 1 volume, 0 pages.

1934 669 .1

RNÉRIAS (R.).

Manuel des aciéries.

Paris, J.-B. Baillière et Fils. 1 volume, 268 pages et figures. (Prix: 19 francs français.)

1934 691

PITALLIER (G.).

Cours supérieur de béton armé.

Paris (5e), Léon Eyrolles, 3, rue Thénard. 3 volumes.

Livre I. **Procédés généraux de construction et calcul ouvrages:** 398 pages et 250 figures.

Livre II. **Constructions en béton armé:** 637 pages et figures.

Livre III. **Les ponts en béton armé:** 446 pages et figures.

(Prix: respectivement 45, 90 et 90 francs français.)

1934 621 .43

LDT (P. M.).

Les moteurs Diesel à grande vitesse.

Paris, Dunod, 92, rue Bonaparte. 1 volume, 440 pages 225 figures. (Prix: 68 francs français.)

1934 624 (01

AGNEL (G.).

Le calcul pratique des poutres Vierendeel.

Gand, Van Rysselberghe et Rombaut. 1 volume, 120 ges, 3 albums de planches.

1934 691

MERCIOT (A.).

Manuel du cimentier.

Paris, Garnier frères. 1 volume, 208 pages et 76 figures. (Prix: 9 francs français.)

1934 721. (02

NACHTERGAEL (A.).

Agenda du bâtiment.

Paris (6e), Librairie Polytechnique Ch. Béranger. 1 volume (11×18), 432 pages avec 415 figures. (Prix: 22 francs français.)

1934 385. (08 (.44)

Rapports du Conseil d'administration et de la Commission de vérification des comptes de la Compagnie du Chemin de fer de Paris à Orléans. Assemblée générale des actionnaires du vendredi 23 mars 1934.

Paris, Compagnie du P. O. 1 volume, 91 pages.

1934 313 : 656 .225 (.438)

Résumé général du tonnage des marchandises transportées par les Chemins de fer de l'Etat polonais pendant l'exercice 1932.

Warszawa, Ministère des Communications. 1 volume, 296 pages.

1934 347

SACHET (A.).

Accidents du travail et maladies professionnelles.

Paris, Librairie du Recueil Sirey, 22, rue Soufflot. 1 volume, 749 pages. (Prix: 60 francs français.)

1934 62. (03

SCHLOMANN (A.).

Dictionnaires techniques illustrés en six langues: français, allemand, anglais, espagnol, italien et russe.

Paris (6e), Dunod, 92, rue Bonaparte.

I. **Eléments des machines. — Outils usuels.** 1 volume (11×18), 403 pages, 823 figures. (Prix: 36 francs français).

II. **Electrotechnie.**

III. **Chaudières, machines, turbines à vapeur.** 1 volume (11×18), 1 322 pages et 3 500 figures. (Prix: 120 francs français.)

(1) The numbers placed over the title of each book are those of the decimal classification proposed by the Railway Congress **onjointly with the Office Bibliographique International, of Brussels.** (See « Bibliographical Decimal Classification as applied to ailway Science », by L. WEISSENBRUCH, in the number for November 1897, of the *Bulletin of the International Railway Congress*, 1509).

IV. **Moteurs à combustion interne.** 1 volume (11×18), 618 pages et 1 900 figures. (Prix: 52 francs français.)

V. **Chemins de fer (construction et exploitation).** 1 volume (11×18), 870 pages et 1 900 figures. (Prix: 77 francs français.)

VI. **Chemins de fer (matériel roulant).** 1 volume (11×18), 796 pages et 2 100 figures. (Prix: 71 francs français.)

VII. **Appareils de levage et installations de transport.** 1 volume (11×18), 659 pages et 1 500 figures. (Prix: 57 francs français.)

VIII. **Constructions en béton armé.** 1 volume (11×18), 415 pages et 900 figures. (Prix: 38 francs français.)

IX. **Machines-outils.** 1 volume (11×18), 750 pages et 2 200 figures. (Prix: 66 francs français.)

1934 **313 .385 (.494)**

Statistique des chemins de fer suisses.

Berne, Département fédéral des chemins de fer. 1 volume. (Prix : 10 francs suisses.)

1934 **624 .2**

VIERENDEEL (A.), professeur.

Cours de stabilité des constructions. Complément du tome IV: **Calcul des poutres du type parabolique; soudure.**

Louvain, Librairie Universelle et Paris, Dunod. 1 brochure, 10 pages avec 4 planches. (Prix: 10 francs belges.)

In German.

1934 **721 .9**

BEYER (K.).

Die Statik im Eisenbetonbau.

Berlin, Julius Springer. 1 Band, 389 Seiten, 572 Abbildungen und Zahlentafeln. (Preis: 32.50 R.M.)

1934 **625. (02**

Elsners Taschenbuch für den bautechnischen Eisenbahndienst.

Berlin, Otto Elsner Verlagsgesellschaft. 1 Band, 387 Seiten und Abbildungen. (Preis: 3.60 R.M.)

1934 **0**

Erweitertes Schlagwortverzeichnis zur deutschen Kurzausgabe der Dezimal-Klassifikation.

Frankfurt/M., Internationales Institut für Dokumentation. 1 Band, 111 Seiten. (Preis: 5 R.M.)

1934 **62. (01 & 691**

GIRNDT (M.).

Baustoffkunde.

Leipzig und Berlin, B. G. Teubner. 1 Band, 196 Seiten und 148 Abbildungen. (Preis: 8 R.M.)

1934 **691 & 721 .9**

Handbuch für Eisenbetonbau.

Leipzig, Johann Ambrosius Barth und Brüssel, Falk, Fils, 22, rue des Paroissiens. 1 Band. (Preis: 5.50 R.M.)

1934 **721**

HENKEL (O.).

Grundzüge des Stahlbaues.

Leipzig und Berlin, Teubner, R. G. 1 Band, 254 S ten und 557 Abbildungen. (Preis: 8.40 R.M.)

1934 **656 .237 (.**

KOHLER (F.).

Das Problem der Betriebsbuchführung bei der De schen Reichsbahn Gesellschaft.

Leipzig, Verlagsbuchhandlung Wilhelm Hoppe. Band. (Preis: 4.50 R.M.)

1934 **62. (01 & 721**

KURT BEYER.

Die Statik im Eisenbetonbau.

Berlin und Wien, Julius Springer. 1 Band, 389 S ten und 572 Abbildungen. (Preis: 32.50 R.M.)

1934 **62.**

LEHR (E.).

Schwingungstechnik.

Leipzig, Johann Ambrosius Barth und Brüssel, Fa Fils, 22, rue des Paroissiens. 1 Band, 373 Seiten 243 Abbildungen. (Preis: 30 R.M.)

1934 **62. (01 &**

LEHR (E.).

Spannungsverteilung in Konstruktions-Elementen

Leipzig, Johann Ambrosius Barth und Brüssel, Fa Fils, 22, rue des Paroissiens. 1 Band, 64 Seiten und Abbildungen. (Preis: 7.50 R.M.)

1934 **656.**

PIRATH (C.).

Die Grundlagen der Verkehrswirtschaft.

Berlin, Julius Springer. 1 Band, 263 Seiten. (Pre 19.50 R.M.)

1934 **621 .**

SPALCKHAVER (R.) und RUSTER (A.).

Die Dampfkessel nebst ihren Zubehörteilen Hilfseinrichtungen.

Berlin, Julius Springer. 1 Band, 190 Seiten, 2 Taf und 338 Abbildungen. (Preis: 32 R.M.)

In English.

1934 **656 .25 (06 (.**

AMERICAN RAILWAY ASSOCIATION.

Proceedings, Signal Section. Advance notice, forti annual meeting, Chicago, Ill., March 12 and 13, 1934

New York, Published by the Association, 30, Ve Street. Vol. XXXI, No. 1, 384 pages.

1934 **621**

BERNARD (W. N.), ELLENWOOD (F. O.) HIRSCHFELD (C. F.).

Elements of heat power engineering. Part II: Ste generating apparatus and prime movers, fuels, co bustion and heat transmission. Part III: Auxili equipment, plant ensemble, air conditioning, and frigeration.

London, W. C. 2, Chapman and Hall, Ltd., 11, H rietta Street. (Price: Vol. II, 34 sh. net.; Vol. 28 sh. net.)

1934 659 (.42)

acts abouts British Railways 1934.

London, S. W. 1. Issued by The British Railway ess Bureau, 35, Parliament Street, on behalf of the eat Western; London and North Eastern; London idland and Scottish; and Southern Railway Com- nies. A pamphlet of 28 pages.

1934 51. (08

ALL INGLIS (J.).

« The Rapid » pocket steel, iron and metal reckoner: eight of steel or iron bars.

London, W.C. 2. Gall and Inglis, 13, Henrietta reet. (Price: 1 sh. 6 d. net.)

1934 529 (06

Journal of calendar reform. 10 articles on calendar form. Press reviews, etc. Vol. IV. No. 1.

New York City. Published by the World Calendar ssociation, Inc. 48 pages.

1934 621 .31

JSTIN (J. O.) & MERVINE (W. G.).

Power supply economics.

London, W.C. 2. Chapman and Hall, Ltd., 11, Hen- etta-street. (Price: 21 sh. 6 d. net.)

1934 385. (093 (.73)

ERR (John Leeds).

The Louisville and Nashville. An outline history.

New York. Published by Young and Ottley, Inc, 1/4×6 inches), 67 pages. (Price: $ 1.00.)

1934 625 .176 (.54)

ITCHLEW (R. N.), B. Sc.

Gauge policy on Indian railways.

Allahabad. Published by the author, 37, Kutcherry oad. (7 1/2×5 inches), 121 pages. (Price: Rs. 2.)

1934 38 & 656

ILLER (S. L.).

Inland transportation.

New York and London. Published by McGraw-Hill ook Co. (6×9 inches), 822 pages, tables and diagrams. rice: $ 4.00.)

1934 385 (091 (.54)

ITCHELL (J. W.), A. M. Inst. T.

The wheels of India.

London, W.C. 2. Thorton Butterworth Ltd., 15, Bed- rd Street, Strand. (9×6 inches, 314 pages. (Price: sh. 6 d. net.)

1934 693

Notes on cement and reinforced concrete.

Sheffield. Sir W. C. Leng and Co. (Sheffield Tele- raph), Ltd., High-Street. (Price: 7 sh. 6 d. net.)

1934 621 .43 (02

OSBLOOM (Julius).

Diesel reference guide.

Jersey City, N. J. (U. S. A.). Industrial Institute, Inc.

1934 536

SCHÜLE (W.), Prof., Dipl-Ing.

Technical thermodynamics. Translated by E. W. GEYER, B. Sc.

London, W.C. 2. Sir Isaac Pitman and Sons, Ltd., Parker Street. (9 1/2×6 inches), 623 pages, 323 line drawings. (Price: 40 sh. net.)

1933 625 .14 (01 (.54) & 625 .143.4 (.54)

SIMS (A. M.), B. Sc. (Eng.), Assoc. M. Inst. C. E. track supply officer, North Western Ry. (India).

Stresses in fishplates for 90 lbs. rails (with conclusions affecting the design of standard rail and fishplate sections).

Delhi. Copies obtainable from the Manager of Publications. Technical paper No. 286. (Price: 12 annas or 1 sh. 3 d.)

1934 62. (01

ST. JOHN (A.), Ph. D. & ISENBURGER (H. R.).

Industrial radiography.

London, W.C. 2. Chapman and Hall, Ltd., 11, Henrietta-street. (Price: 21 sh. 6 d. net.)

1934 385. (091 (.42) & 659 (.42)

Ten years of progress (1923-1932) on the Southern Railway (England).

London, Southern Railway, Waterloo Station. (7 1/2×5 inches), 32 pages.

1934 625 .142.2 & 691

Termites and termite control.

Berkeley, California. Published by the University of California Press. (9×6 inches), 734 pages. (Price: $ 5.00).

1934 62. (01

TIMOSHENKO (S.)

Theory of elasticity.

New York and London. Published by McGraw-Hill Book Co. Inc. (6×9 inches), 416 pages, tables and diagrams. (Price: $ 5.00.)

1934 625 .234 & 697

VERNON (H. M.), M. A.

The principles of heating and ventilation.

London, W. 1. Ed. Arnold and Co., 41, Maddox Street. (Price: 14 sh. net.)

In Spanish.

1934 385. (02 & 656. (02

IMEDIO (A.).

Ferrocarriles, Explotación y Legislación.

Madrid, Imedio Alfonso, Avenida Pi y Margall, 12. 1 volumen (16×23), 944 páginas. (Precio: 30 pesetas.)

1934 385. (08 (.460)

TORRE (E. de la).

Anuario de ferrocarriles y tranvias, 1933.

Madrid, Päez, S. A. 1 volumen (15×22 cm.), 389 páginas y un mapa. (Precio: 7 pesetas.)

In Italian.

1934 **385 .11**

ARNAO (B.).

La determinazione dei costi nelle imprese ferroviarie.

Firenze, Stabilimento typografico già G. Civelli. 1 volume, 19 pagine.

1934 **656 (.45)**

Guida dei trasporti per l'estero, ferrovie, navigazione, poste, aviazione.

Roma, Istituto nazionale per l'esportazione. 1 volume.

1934

SESTINI (Q.).

La chimica del cemento.

Milano, Ulrico Hoepli. 1 volume (18×25), 228 pag 20 tabelle e 66 fig.

1934

ZAMBONI (C.).

Il controllo dei cementi.

Milano, Ulrico Hoepli. 1 volume (20×29), 500 gine. (Prezzo: 75 Lire.)

In Dutch.

1934

BERGSMA (P.).

Beton en gewapend beton.

Amsterdam, Kosmos. 1 handboek. (Prijs: 7.90

[**016. 385. (05**]

II. — PERIODICALS.

In French.

Annales des ponts et chaussées. (Paris.)

1934 **656 .27 (.44)**

Annales des ponts et chaussées, janvier-février, p. 36.

ROY (R.). — **Exploitation des lignes à faible trafic** des grands réseaux de chemins de fer par des compagnies secondaires. (9 000 mots.)

Arts et Métiers. (Paris.)

1934 **62. (01 & 669**

Arts et Métiers, mars, p. 6.

MARCOTTE (E.). — Les derniers **progrès métallurgiques** techniques et économiques. (20 000 mots et fig.)

Bulletin de la Société alsacienne de constructions mécaniques. (Paris.)

1934 **621 .95**

Bull. de la Soc. alsacien. de Constr. mécan., janvier, p. 1.

BOUVIER (A.). — **Aléseuses-fraiseuses** « Graffenstaden ». (4 200 mots & fig.)

Bulletin de la Société des ingénieurs civils de France. (Paris.)

1934 **625 .251**

Bull. de la Soc. des Ing. civ. de France, P. V. de la séance du 23 mars, p. 153.

Freinage des automotrices de chemins de fer. (Communication de M. Borde et discussion.) (4 500 mots.)

Bulletin de l'Union internationale des chemins de fer. (Paris.)

1934 **621 .43 (**

Bull. de l'Union intern. des ch. de fer, février, p.

DUMAS (L.). — Les **automotrices** françaises fin de 1933. (9 800 mots et fig.)

1934 **385 .6**

Bull. de l'Union intern. des ch. de fer, février, p.

SPIESS (W.). — Les nouvelles **conventions pou trafic international des chemins de fer.** (5 000 mo

---

1934 **385 .113 (**

Bull. de l'Union intern. des ch. de fer, février, p.

Les **chemins de fer exploités par l'Etat fran** pendant l'exercice 1932. (7 300 mots & fig.)

1934 **388 (**

Bull. de l'Union intern. des ch. de fer, février, p.

Le **nouveau régime des transports en commun** l'agglomération de Londres. (7 000 mots.)

Bulletin des transports internationaux par chemins de fer. (Paris.)

1934 **656 .2**

Bull. des transp. intern. par ch. de fer, mars, p.

KASPRAK (Wl.).— **Wagons spéciaux de particul** (1 500 mots.)

1934 **313 .385 (.47**

Bull. des transp. intern. par ch. de fer, mars, p.

Statistique des Chemins de fer de l'Etat d'Est pour l'exercice 1932-33. (900 mots.)

1934 **313 .385 (.4**

Bull. des transp. intern. par ch. de fer, avril, p.

Statistique des Chemins de fer suisses pour l'e cice 1932. (1 500 mots.)

Bulletin technique de la Suisse romande. (Vevey.)

1934 **691**
ll. techn. de la Suisse romande, 14 avril, p. 85.
BOLOMEY (J.). — **Le béton vibré ou pervibré**, ses
opriétés et conditions d'emploi. (1 700 mots.)

1934 **62. (01 & 621 .392**
ll. techn. de la Suisse romande, 14 avril, p. 87.
ROSENTHAL (D.). — Nos connaissances actuelles
r l'état des **tensions dans les cordons de soudure.**
100 mots & fig.) (A suivre.)

1934 **721 .1**
ll. techn. de la Suisse romande, 14 avril, p. 89.
A propos de **fondations de bâtiments.** (700 mots.)

---

ulletin technique de l'Union professionnelle des Inspecteurs techniques et des chefs de section des chemins de fer belges. (Bruxelles.)

1934 **656 .253 (.493)**
ll. tech. de l'Union profes. des Inspecteurs tech. et des
Chefs de sect. des ch. de fer belges, 15 mars, p. 1.
VANDERSTRAETEN (E.). — Les nouveaux **séma-**
ores à manœuvre mécanique et leurs transmissions.
100 mots & fig.)

1934 **625 .173**
ll. tech. de l'Union profes. des Inspecteurs tech. et des
Chefs de sect. des ch. de fer belges, 15 mars, p. 10.
CALLANT. — **Renforcement de la voie** pendant les
vaux d'infrastructure. (1 600 mots & fig.)

Chronique des transports. (Paris.)

1934 **656 .283 (.44)**
ronique des transports, nº 6, 25 mars, p. 8.
La fin du débat sur l'accident de Lagny à la
ambre française (4 000 mots.)

1934 **385 .113 (.44)**
ronique des transports, nº 7, 10 avril, p. 3.
La Compagnie d'Orléans en 1933. (3 500 mots.)

1934 **385 .113 (.44)**
ronique des transports, nº 7, 10 avril, p. 7.
Les Chemins de fer de l'Etat français en 1932.
400 mots.)

Génie civil. (Paris.)

1934 **625 .13 (.42)**
nie civil, nº 2693, 24 mars, p. 261.
Le tunnel routier sous la Mersey entre Liverpool et
Birkenhead. (2 900 mots & fig.)

1934 **62. (01, 691 & 693**
Génie civil, nº 2693, 24 mars, p. 264; nº 2694, 31 mars, p. 289.
PIGEAUD (G.). — **Les ouvrages en maçonnerie, en béton ou en béton armé.** (9 400 mots & fig.)

1934 **656 .25 (.44) & 656 .283 (.44)**
Génie civil, nº 2693, 24 mars, p. 277.
La **sécurité des voyageurs** en chemin de fer. Les enseignements de la catastrophe de Lagny, près de Paris. (1 100 mots.)

1934 **621 .133.7**
Génie civil, nº 2693, 24 mars, p. 278.
Les traitements de l'**eau d'alimentation** des chaudières, en Allemagne. (600 mots.)

1934 **656 .254 (.44)**
Génie civil, nº 2694, 31 mars, p. 293.
Le nouveau **poste central d'aiguillage** de la gare de Paris des Chemins de fer du P. L. M. (1 700 mots & fig.)

1934 **621 .43**
Génie civil, nº 2694, 31 mars, p. 300.
Le mouvement des gaz dans les **moteurs Diesel** à deux temps, pendant le balayage. (1 500 mots & fig.)

1934 **62. (01**
Génie civil, nº 2695, 7 avril, p. 314.
MAUVERNAY (P.). — L'équilibre des **surfaces de révolution symétriquement chargées.** (4 500 mots et fig.)

1934 **621 .43 (.42)**
Génie civil, nº 2695, 7 avril, p. 317.
L'automotrice à moteur à essence de 130 ch. du Great Western Railway (Angleterre). (2 300 mots & fig.)

1934 **621 .13 & 625 .251**
Génie civil, nº 2695, 7 avril, p. 321.
Le **freinage des automotrices** de chemins de fer. (2 600 mots & fig.)

1934 **621 .392**
Génie civil, nº 2695, 7 avril, p. 323.
Les récents progrès dans la **soudure électrique.** (1 200 mots & fig.)

1934 **62. (01 & 691**
Génie civil, nº 2696, 14 avril, p. 336.
LEBELLE (J.). — Relation entre les caractéristiques du **béton** et l'emploi de la vibration. (3 000 mots & fig.)

1934 **385 .4 (.44) & 656 (.44)**
Génie civil, nº 2697, 21 avril, p. 352.
MARCEAU (J. L.). — **Modifications apportées aux conventions et au cahier des charges** des Grands Réseaux de chemins de fer français. (4 000 mots.) A suivre.)

1934 **62. (01**
Génie civil, nº 2697, 21 avril, p. 355.
HORMIDAS. — Les **voûtes** minces autoportantes en béton armé. (3 000 mots & fig.)

1934 **385 .1 (.44)**
Génie civil, n° 2697, 21 avril, p. 360.
Le nouveau **régime financier** des transports en commun, en surface, de la région parisienne. (2 100 mots.)

L'Allègement dans les Transports. (Lucerne.)

1934 **625 .232**
L'Allègement dans les transports, mars-avril, p. 26.
KLIESCH (M.). — **Schlafwagen** mit Einbett-Abteilen (1 000 Wörter & Abb.)

1934 **625 .2 (0**
L'Allègement dans les transports, mars-avril. p. 29.
GILARDI (U.). — **De l'allègement du matériel roulant** par l'emploi de métaux spéciaux. (1 400 mots & fig.)

La Science et la Vie. (Paris.)

1934 **621 .132.8 & 621 .43**
La Science et la Vie, avril, p. 285.
ROURET (M. du). — Le **moteur Diesel** a déjà conquis la traction routière. S'imposera-t-il aussi pour la traction ferroviaire? (4 700 mots & fig.)

1934 **656 .254**
La Science et la Vie, avril, p. 333.
LABADIÉ (J.). — En **signalisation ferroviaire** voici ce qu'il reste à faire. (6 600 mots & fig.)

1934 **621 .89**
La Science et la Vie, mai, p. 383.
TINARD (H.). — Voici les **lubrifiants solides** qui évitent les défaillances des lubrifiants liquides. (4 700 mots & fig.)

Les Chemins de fer et les Tramways. (Paris.)

1934 **621 .43**
Les Chemins de fer et les Tramways, avril, p. 80.
SPIESS (E.). — **Automotrices pétroléo-électriques.** (12 600 mots & fig.)

1934 **621 .132.3 (.44)**
Les Chemins de fer et les Tramways, avril, p. 89.
VIÉ (G.). — **Transformations aux locomotives 4-500** du réseau d'Orléans. (1 500 mots & fig.)

1934 **625 .213**
Les Chemins de fer et les Tramways, avril, p. 91.
DESGARDES (E.). — **Suspension à** flexibilité variable pour wagons à marchandises. (3 100 mots & fig.)

1934 **625 .259**
Les Chemins de fer et les Tramways, avril, p. 95.
ZOUCKERMANN (A.). — Le **freinage magnétique sur rail** dans les chemins de fer. (5 000 mots & fig.)
(A suivre.)

1934 **625**
Les Chemins de fer et les Tramways, avril, p. 99.
Tête d'attelage automatique. (2 700 mots & fig

1934 **625**
Les Chemins de fer et les Tramways, avril, p. 102.
DUCHESNOY. — Les **heurtoirs freinants.** (1
mots et fig.)

L'Industrie des voies ferrées et des transpo automobiles. (Paris.)

1934 **621**
L'Ind. des voies ferrées et des transp. autom., m
p. 210.
BEZAGUET. — Possibilités actuelles de transfor
tion des **sous-stations** à commutatrices, à comma
manuelle en sous-stations automates. (18 700 m
& fig.)

L'Ossature métallique. (Bruxelles.)

1934 **624 .32 (.47**
L'Ossature métallique, mars, p. 117.
DE WULF (G.). — Le remplacement de la tra
centrale du **pont** de chemin de fer de Dougav
(Lettonie). (1 000 mots & fig.)

1934 **625 .245 & 656**
L'Ossature métallique, mars, p. 132.
Le **wagon route et rail** Willeme Coder. (500 m
& fig.)

1934 **665**
L'Ossature métallique, mars, p. 142.
Les nouvelles **automotrices** « Littorina » constru
par la Société Fiat, à Turin. (500 mots & fig.)

1934 **665**
L'Ossature métallique, mars, p. 144.
RUPPIN (K.). — Les procédés modernes de s
dure autogène. (1 900 mots & fig.)

Revue générale des chemins de fer. (Paris.)

1934 **621 .132.5 (.**
Revue générale des chemins de fer, avril, p. 337.
COSSART (L.). — **Nouvelles locomotives Decap**
du Chemin de fer du Nord. (2 300 mots & fig.)

1934 **621 .132.3 (.4**
Revue générale des chemins de fer, avril, p. 345.
NEBLINGER (J.). — Les **locomotives à grande**
tesse, type 1-D-2 (séries 114 et 214) des Chemins
fer fédéraux autrichiens. (5 700 mots & fig.)

1934 **656**
Revue générale des chemins de fer, avril, p. 374.
La **récupération du trafic** par chemin de fer. (2
mots.)

Revue universelle des Mines. (Liége.)

934 **656 .251**
ue universelle des mines, nº 7, 1er avril, p. 175.
LARD (P.), SWINGS (P.) & BRASSEUR (H.). — principe de la **signalisation lumineuse** de jour et le lème physique des verres de signalisation. (4 800). (A suivre.)

934 **656 .1 & 656 .2**
ue universelle des mines, nº 8, 15 avril, p. 219.
AMPUS (F.). — Le **problème du rail et de la** te. (3 000 mots.)

In German.

Die Lokomotive. (Wien).

934 **621 .132.5 (.73) & 621 .134.3 (.73)**
Lokomotive, März, S. 41.
-D - Vierzylinder - Dreifach - Verbund - Güterzuglokove der Delaware und Hudson-Bahn. (1 500 Wörter bb.)

934 **621 .134.3 (.44) & 621 .134.4 (.44)**
Lokomotive, April, S. 57.
s **Wechselverhältnis, Zwilling oder Verbund, bei Heissdampflokomotiven** der Paris-Lyon-Mittelbahn. (4 800 Wörter & Abb.)

934 **621 .134**
Lokomotive, April, S. 68.
IHOSEK (J.). — Die **Rationalisierung des Zugförngsdienstes** als Folge der Vervollkommnung der mewirtschaft bei den modernen Dampf-Lokomo-. (2 500 Wörter.)

Elektrische Bahnen. (Berlin.)

934 **621 .335 (.73)**
trische Bahnen, Heft 3, März, S. 49.
GER (A.). — Die **elektrische-Ausrüstung** amerischer Einphasen-Wechselstrom-Triebwagen. (3 400 ten & Abb.)

934 **621 .33 (.3)**
trische Bahnen, Heft 3, März, S. 56.
URT-HELLMUT ROLLERT. — Die Entwicklung **elektrischen Zugförderung** in den ausserdeutschen dern. (6 300 Wörter.)

934 **621 .33**
trische Bahnen. Heft 3, März, S. 65.
ECK (B.). — **Selbsttätige Streckenschalter** für hstrom-Bahnbetriebe. (1 700 Wörter & Abb.)

934 **621 .33 (.494)**
trische Bahnen, Heft 3, März, S. 68.
ÜRLER (W.). — **Zehn Jahre elektrischer Betrieb** Rhätischen Bahn. (1 800 Wörter & Abb.)

Glasers Annalen. (Berlin.)

1934 **625 .4**
Glasers Annalen, Heft 5, 1. März, S. 33.
MÜLLER (A. H.). — Das **Schwebzugsystem.** Neue Formen von Hängebahnen und ihre verkehrswirtschaftliche Bedeutung für Massengut- und Personenbeförderung. (4 000 Wörter & Abb.)

1934 **62. (01 & 669**
Glasers Annalen, Heft 6, 15. März, S. 41.
WIDEMANN (M.). — Die **Strukturprüfung** von Schwermetal - Erzeugnissen **durch Gamma-Strahlung.** (1 900 Wörter & Abb.) (Schluss folgt.)

1934 **385 .113 (.73)**
Glasers Annalen, Heft 6, 15 März, S. 44.
WERNEKKE. — Die **Eisenbahnen der Vereinigten Staaten** um die Jahreswende 1932-33. (3 300 Wörter.)

1934 **62. (01 & 669**
Glasers Annalen, Heft 7, 1. April, S. 49.
WIDEMANN (M.). — Die **Strukturprüfung** von Schwermetall - Erzeugnissen **durch Gamma - Strahlung.** (1 700 Wörter & Abb.)

Organ für die Fortschritte des Eisenbahnwesens. (Berlin.)

1934 **625 .13 (.45)**
Organ für die Fortschritte des Eisenbahnwesens, Heft 6, 15. März, S. 103.
HACKE. — Der Grosse **Apennintunnel.** (9 600 Wörter, 4 Tafeln & Abb.)

1934 **625 .113**
Organ für die Fortschritte des Eisenbahnwesens, Heft 6, 15. März, S. 115.
WENTZEL. — Zur Gestaltung des **Übergangsbogens;** eine Verteidigung der kubischen Parabel. (2 400 Wörter, 1 Tafel & Abb.)

1934 **625 .212**
Organ für die Fortschritte des Eisenbahnwesens, Heft 7, 1. April, S. 121.
Verein Mitteleuropäischer Eisenbahnverwaltungen. Theoretische Untersuchungen zur Entwicklung einer verbesserten **Umrisslinie für Radreifen.** (9 800 Wörter, 4 Tafeln & Abb.)

1934 **621 .132.8 & 621 .134.3**
Organ für die Fortschritte des Eisenbahnwesens, Heft 8, 15. April, S. 21.
MÖLBERT. — Die Verwendungsmöglichkeit von hoch gespanntem Dampf im **Triebwagenbetrieb.** (6 600 Wörter & Abb.)

1934 **625 .214**
Organ für die Fortschritte des Eisenbahnwesens, Heft 8, 15 April, S. 147.
ROTHEMUND (M.) & BACHMAIER (W.). — **Prüfstandversuche** mit einer neuen Schmiervorrichtung für Eisenbahnwagen-Achslager. (1 000 Wörter & Abb.)

1934 **625 .113 & 625 .151**
Organ für die Fortschritte des Eisenbahnwesens, Heft 8, 15. April, S. 149.
HÖFER. — **Bogenweichen** im Übergangsbogen. (1 900 Wörter & Abb.)

Zeitschrift des Vereines Deutscher Ingenieure. (Berlin.)

1934 **669 .1**
Zeitsch. des Ver. deutsch. Ing., Nr. 12, 24. März, S. 369.
HENNECKE (R.). — **Alteisen als Rohstoff** für die Stahlerzeugung im Siemens-Martin-Ofen. (4 200 Wörter & Abb.)

1934 **721 .1**
Zeitsch. des Ver. deutsch. Ing., Nr. 12, 24. März, S. 379.
LORENZ (H.). — Neue Ergebnisse der **dynamischen Baugrunduntersuchung.** (4 900 Wörter & 3 Tafeln.)

1934 **62. (01**
Zeitsch. des Ver. deutsch. Ing., Nr. 13, 31. März, S. 395.
LEHR (E.). — Die Auswirkung der neuen **Festigkeitsforschung** in der Praxis. (5 700 Wörter & Abb.)

1934 **625 .14 (01**
Zeitsch. des Ver. deutsch. Ing., Nr. 13, 31. März, S. 405.
RAAB (F.). — Die **Stabilität des Schienenweges** unter neuen Gesichtspunkten. (4 600 Wörter & Abb.)

1934 **691**
Zeitsch. des Ver. deutsch. Ing., Nr. 13, 31. März, S. 415.
ELSSNER (G.). — **Verchromung von Oberflächen.** Eigenschaften/Verfahren. (4 800 Wörter & Abb.)

1934 **621 .43**
Zeitsch. des Ver. deutsch. Ing., Nr. 14, 7 April, S. 436.
GRANTZ (S.) & RIEPPEL (P.). — Das Fremdverdichtungsverfahren zum **Antrieb von Diesel-Lokomotiven und Triebwagen.** (1 300 Wörter & Abb.)

1934 **621 .32**
Zeitsch. des Ver. deutsch. Ing., Nr. 15, 14. April, S. 451.
LUX (H.). — Fortschritte der **Lichttechnik.** (4 100 Wörter & Abb.)

1934 **691**
Zeitsch. des Ver. deutsch. Ing., Nr. 15, 14. April, S. 472.
NAUMANN (E.). — **Korrosionsschutz** bei Warmwasser-Versorgungsanlagen. (5 800 Wörter & Abb.)

1934 **625 .1 (.431) & 627 (.431)**
Zeitsch. des Ver. deutsch. Ing., Nr. 16, 21. April, S. 495.
KLAMMT (C.). — Der **Rügendamm.** (5 900 Wörter & Abb.)

Zeitung des Vereins mitteleuropäischer Eisenbahnverwaltungen. (Berlin.)

1934 **656 .225 (.43)**
Zeitung des Vereins mitteleurop. Eisenbahnverw. Nr. 12, 22. März, S. 221.
ZEITLER. — Die **Motorisierung des Stückgutverkehrs.** (1 500 Wörter).

1934 **625 .3 (.4**
Zeitung des Vereins mitteleurop. Eisenbahnverw. Nr. 29. März, S. 237.
SALLER. — **Elektrische Kugel-Mulden-Bahn** 300 km/Std Geschwindigkeit bei den Sowjets. (Wörter & Abb.)

1934 **385. (06.4 (.4**
Zeitung des Vereins mitteleurop. Eisenbahnverw. Nr. 29. März, S. 239.
HOFFMAN. — **Die Reichsbahndirektion Hanno** stellt aus. (1 900 Wörter & Abb.)

1934 **656 .21**
Zeitung des Vereins mitteleurop. Eisenbahnverw. Nr. 5. April, S. 262.
NÜRNBERGER. — Sicherung von **Ladebrück** (300 Wörter & Abb.)

1934 **656 .222.1 & 656 .2**
Zeitung des Vereins mitteleurop. Eisenbahnverw. Nr. 12 April, S. 273.
BÄSELER. — **Schnellfahren und nicht entgleis** (5 700 Wörter & Abb.)

Zeitschrift für das gesamte Eisenbahn-Sicherungswesen. (Berlin.)

1934 **656 .2**
Zeitsch. für das gesamte Eisenb.-Sicherungsw. N. 10. April, S. 61.
WAGNER (Th.). — Das **Mehrreihenstellwerk.** (2 Wörter & Abb.)

1934 **656 .2**
Zeitsch. für das gesamte Eisenb.-Sicherungsw. N. 10. April, S. 65.
BUDDENBERG. — Das **dreibegriffige Vorsig** (4 000 Wörter & Abb.) (Fortsetzung folgt.)

In English.

Annals, American Academy of Political and Social Science. (Philadelphia).

1934 **33 (06 (.7**
Annals, Amer. Acad. of Polit. and Social Scie March, p. 1.
Towards national recovery. — Adresses delivered the January conference of the Academy, being résumé of the work of the National Recovery Ad nistration, with special reference to business, la and the consumer.

Bulletin, American Railway Engineering Association. (Chicago, Ill.)

1934 **656 .2 (.**
Bull., Amer. Ry. Engineering Asson, February, p. 8
Report of Committee on economics of **railways op ation.** — Methods or formulæ for the solution

cial problems relating to more economical and icient railway operation. — Methods for determin- most economical train length. — Effect of volume traffic on railway operating expenses, etc. (13 000 rds, tables & fig.)

---

934 **625 .14 (.73), 625 .15 (.73) & 625 .17 (.73)**
ll., Amer. Ry. Engineering Asson, February, p. 923.
Report of Committee on **track.** — Plans and specifi- ions for track tools. — Plans for switches, frogs, ssings, slip switches, etc. — Design of tie plates for E. rail sections. — Desirable tightness of track nts and effect upon life of rails and joints of over- nt joints; of loose joints. — Methods of recondition- of rail ends, fastenings, frogs and switches in ck. Damage to track and devices due to brine dripp- s from refrigerators cars, etc. (11 000 words & fig.)

---

934 **69 (.73) & 72 (.73)**
ll., Amer. Ry. Engineering Asson, February, p. 957.
Report of Committee on **masonry.** — Specifications l principles of design of plain and reinforced con- te. — Progress in the science and art of concrete nufacture. — Foundations. — General specifications foundations of railway structures. Tentative spe- cations for lining railway tunnels with concrete. — eumatically projected concrete, etc. (17 000 words ig.)

---

934 **624**
ll., Amer. Ry. Engineering Asson, February, p. 997.
Report of Committee on **wooden bridges and trestles.**
ign of standard wooden trestles for heavy loading. Shear in checked beams, by J. A. NEWLIN. — thods of strengthening existing bridges, etc. (5 000 rds & fig.)

---

934 **624 (.73) & 69 (.73)**
ll., Amer. Ry. Engineering Asson, February, p. 1011.
Report of Committee on **iron and steel structures.** Specifications for steel railway bridges for fixed ns not exceeding 400 feet in length (1934). (23 000 rds & fig.)

---

934 **65 (.71 + .73)**
ll., Amer. Ry. Engineering Asson, February, p. 1065.
Report of Committee on **standardization.** — Status A. R. A. recommended standards for railway high- y grade crossing protection. — American Standards ociation (A. S. A.). — Canadian Engineering Stan- ds Association (C. E. S. A.). — Standards approved American Standards Association. — American ndards Association technical projetcs on which Rail- y Associations are now cooperating. (6 000 words.)

---

934 **625 .1 (06 (.73)**
ll., Amer. Ry. Engineering Asson, March, p. 1.
Program of the thirty-fith annual convention and r book. **List of members.**

Engineer. (London.)

934 **621 .165**
gineer, No. 4080, March 23, p. 294; No. 4081, March 30, p. 320.
he development of the Parsons **steam turbine.** XII. (6 200 words & fig.)

1934 **669 (06 (.42)**
Engineer, No. 4080, March 23, p. 296.
The Institute of Metals. No. III. Meeting on Thursday 8th March 1934. — Silver-beryllium alloys. — Sand cast aluminium. — Copper-iron-silicon alloys. (2 800 words.)

1934 **727 .5 (.42)**
Engineer, No. 4080, March 23, p. 301.
An all-concrete laboratory. (1 100 words & fig.)

1934 **62. (01 & 627**
Engineer, No. 4080, March 23, p. 302.
Deterioration of structures in sea water. (2 300 words.)

1934 **62. (01 & 669**
Engineer, No. 4081, March 30, p. 332.
QUINNEY (H.). — Time effect in testing metals. (1 600 words & fig.)

1934 **621 .132.6 (.42)**
Engineer, No. 4081, March 30, p. 337.
L. M. S. Railway — **three cylinder tank engines.** (300 words & fig.)

1934 **621 .45**
Engineer, No. 4082, April 6, p. 344; No. 4083, April 13, p. 368.
The development of the Parsons **steam turbine.** (7 700 words & fig.)

1934 **621 .43 & 669 .1**
Engineer, No. 4083, April 13, p. 373.
Nickel-iron alloys in I. C. engine construction. (1 300 words & 1 table.)

1934 **621 .31 (.42)**
Engineer, No. 4083, April 13, p. 381.
Extensions at the Brimsdown « B » **power station.** (4 600 words & fig.)

1934 **621 .95**
Engineer, No. 4083, April 13, p. 384.
Three small **drilling machines.** (600 words & fig.)

1934 **62 (01**
Engineer, No. 4083, April 13, p. 386.
Precision **hydraulic testing machine.** (600 words & fig.)

1934 **621 .18**
Engineer, No. 4083, April 13, p. 387.
SWALLOW (M. G. S.). — The « Velox » **steam generator.** (3 000 words, tables & fig.)

1934 **656 .211.7 (.42) & 699 (.42)**
Engineer, No. 4084, April 20, p. 398.
Southern Railway **train ferries.** (2 000 words & fig.)

1934 **625 .1 (06 (.73)**
Engineer, No. 4084, April 20, p. 402.
American Railway Engineering Convention. (2 500 words & fig.)

1934 **656 .256.3 (.42) & 656 .283 (.42)**
Engineer, No. 4084, April 20, p. 405.
Collisions under automatic railway signalling. (1 700 words.)

1934 **621 .132.8**
Engineer, No. 4084, April 20, p. 412.
The Franco locomotive. (400 words & fig.)

1934 **621 .31 (.42)**
Engineer, No. 4085, April 27, p. 434.
An underground **rectifier sub-station.** (1 200 words & fig.)

1934 **621 .43**
Engineer, No. 4085, April 27, p. 439.
A high-speed locomotive type oil engine. (1 100 words & fig.)

1934 **669**
The Metallurgist, p. 115, Supplt. to the Engineer, April 27.
White metal bearing alloys. (800 words & 3 tables.)

1934 **62. (01 & 669 .1**
The Metallurgist, p. 117, Supplt. to the Engineer, April 27.
Columbium in chromium-nickel steels. (800 words & 3 tables.)

1934 **62. (01 & 669 .1**
The Metallurgist, p. 123, Supplt. to the Engineer, April 27.
PEARCE (J. G.). — **Impact testing of cast iron.** (1 100 words.)

1934 **621 .392 & 669 .1**
The Metallurgist, p. 128, Supplt. to the Engineer, April 27.
The **welding** of high-tensile structural steels. (700 words.)

Engineering. (London.)

1934 **621 .94**
Engineering, No. 3558, March 23, p. 345.
The Herbert preoptive headstock. (2 100 words & fig.)

1934 **62. (01 & 627**
Engineering, No. 3558, March 23, p. 352.
The **deterioration of structures in sea-water** (1 800 words.)

1934 **62 (.064 (.43)**
Engineering, No. 3558, March 23, p. 382.
Machine tools at the Leipzig Fair. (2 500 words & fig.)

1934 **621 .132.6 (.42)**
Engineering, No. 3558, March 23, p. 386.
Three-cylinder 2-6-4 type **tank locomotive** for the L. M. S. Ry. (500 words & fig.)

1934 **347 .763 (.42**
Engineering, No. 3560, April 6, p. 405.
The Road Traffic Bill. (1 900 words.)

1934 **62 (064 (.43**
Engineering, No. 3560, April 6, p. 410.
Machine tools at the Leipzig Fair. (2 800 words & fig

1934 **669 .1 & 721**
Engineering, No. 3560, April 6, p. 415.
Chromador steel. (2 000 words, 3 tables & fig.)

1934 **621 .33 (.45) & 625 .62 (.45**
Engineering, No. 3561, April 13, p. 430.
The Turrinelli **trolley 'bus.** (1 000 words & fig.)

1934 **621**
Engineering, No. 3561, April 13, p. 439.
COKER (E. G.) & RUSSELL (R.). — The influen of keys and keyways on cylindrical force fits a shrinkage fits. (2 000 words & fig.)

1934 **621 .**
Engineering, No. 3561, April 13, p. 441.
BRILLIE (M. H.). — **The lubrication of bearin** provided with oil circuits. (3 500 words & fig.)

1934 **625 .13 (.4**
Engineering, No. 3561, April 13, p. 443.
The repair of Whitehaven **tunnel,** L. M. S. Ry. (6 words & fig.)

1934 **536 & 62. (**
Engineering, No. 3562, April 20, p. 445.
BAILEY (R. W.). — **Thermal stresses** in pipe join for high pressures and temperatures. (3 800 wor & fig.)

1934 **621**
Engineering, No. 3562, April 20, p. 452.
The Keller **automatic tool-room machine.** (1 6 words & fig.)

1934 **6**
Engineering, No. 3562, April 20, p. 453.
Propelling machinery for Southern Railway tra **ferries.** (2 200 words.)

1934 **385 .5 (.4**
Engineering, No. 3562, April 20, p. 462.
Railways and labour. (2 000 words.)

1934 **624 .62 (.94**
Engineering, No. 3562, April 20, p. 467.
BRADFIELD (J. J. C.). — Sydney harbour brid (2 500 words.)

1934 **621**
Engineering, No. 3562, April 20, p. 469.
SWALLOW (M. G. S.). — The Velox **steam gen ator.** (4 300 words, 2 tables & fig.)

1934 **621 .14 (.4**
Engineering, No. 3563, April 27, p. 477.
GILFORD (F. H.). — Modern **road engines.** (1 words & fig.)

1934 **656 .222.1 (.44)**
gineering, No. 3563, April 27, p. 478.
LORD MONKSWELL. — **Locomotive work in France** 1933 — I. (3 800 words & fig.)

1934 **621 .86 (.42)**
gineering, No. 3563, April 27, p. 483.
00-ton **overhead travelling crane.** (700 words & fig.)

1934 **621 .87 (.42) & 656 .213 (.42)**
gineering, No. 3563, April 27, p. 485.
Anti-coal-breaker for ship loading. (1 300 words & .)

1934 **621 .132.3 (.42)**
gineering, No. 3563, April 27, p. 487.
New rolling stock for the L. M. & S. Ry. (900 words fig.)

Engineering News-Record. (New York.)

1934 **625 .13 (.73)**
gineering News-Record, No. 10, March 8, p. 313.
Second **vehicle tunnel** to be built at New York. 800 words & fig.)

1934 **62. (01 & 721 .1**
gineering News-Record, No. 10, March 8, p. 315.
HECK (N. H.). — **Vibration meter** for earthquake dies of buildings. (700 words & fig.)

1934 **62. (01 & 721 .2**
gineering News-Record, No. 10, March 8, p. 316.
TERZAGHI (K.). — Large retaining-wall tests. — . — Action of **water pressure** on fine-grained soils. 200 words & fig.)

1934 **693 & 721 .9**
gineering News-Record, No. 10, March 8, p. 318.
SEIDENSTICKER (F. W.). — Selecting **bearing** ates for steel beams on masonry. (300 words & table.)

1934 **625 .614 (.73)**
gineering News-Record, No. 11, March 15, p. 354.
KOLB (H. J.). — **Surface-track construction** with orated concrete. (1 800 words & fig.)

1934 **624 .51 (.71)**
gineering News-Record, No. 11, March 15, p. 356.
Bridging the St. Lawrence at the Ile d'Orleans. 600 words & fig.)

1934 **624 .51 (.73)**
gineering News-Record, No. 12, March 22, p. 371.
PURCELL (C. H.), ANDREW (Ch. E.) & WOOD-UFF (G. B.). — **San Francisco-Oakland Bay bridge.** 000 words & fig.)

1934 **625 .1 (06 (.73)**
gineering News-Record, No. 12, March 22, p. 386.
Economics and research at Railway Convention. 600 words.)

1934 **625 .143.1 (.73) & 625 .143.4 (.73)**
Engineering News-Record, No. 12, March 22, p. 389.
Standard rail-joint adopted by A. R. E. A. for new 112-lb. rail. (700 words & fig.)

1934 **624 .8 (.73)**
Engineering News-Record, No. 13, March 29, p. 401.
BURKEY (J. R.). — Architectural details emphasized in **bascule-span bridge.** (1 200 words & fig.)

1934 **721 .2**
Engineering News-Record, No. 13, March 29, p. 403.
TERZAGHI (K.). — Large retaining-wall tests. — IV. — Effect of capillary forces in partly saturated fill. (3 500 words & fig.)

1934 **624 .63 (.73)**
Engineering News-Record, No. 13, March 29, p. 416.
MACKENZIE (C. J.). — Winter **bridge building** with relief labor. (Concrete-arch structure about 1 000 ft. long). (3 000 words & fig.)

1934 **624 .1 (.73)**
Engineering News-Record, No. 14, April 5, p. 431.
PURCELL (C. H.), ANDREW (C. E.) & WOOD-RUFF (G. B.). — Bay **bridge foundations** built with unique domed caissons. (3 900 words & fig.)

1934 **624 .2**
Engineering News-Record, No. 15, April 12, p. 471.
DUBERSTEIN (I.). — **Continuous beam** design by successive influence lines. (2 000 words & fig.)

1934 **691 & 693**
Engineering News-Record, No. 16, April 19, p. 493.
Winter concrete construction on Rapide Croche lock. (1 400 words & fig.)

1934 **624 .1 & 721 .1**
Engineering News-Record, No. 16, April 19, p. 499.
SUMMERS (H. J.). — Determining **bearing power** in earth foundations. (2 700 words & fig.)

1934 **62. (01, 624 .82 & 721 .2**
Engineering News-Record, No. 16, April 19, p. 503.
TERZAGHI (K.). — Large retaining wall tests. — V. — Pressure of glacial till. (4 000 words & fig.)

Great Western Railway Magazine. (London.)

1934 **625 .232 (.42)**
Great Western Ry. Magazine, April, p. 173.
An attractive innovation — The **camp-coach holiday.** (650 words & fig.)

Indian Railway Gazette. (Calcutta.)

1934 **656 .284 (.54)**
Indian Railway Gazette, February, p. 32.
Serious earthquake in Bihar (India). — Damage to railway centres. (1 700 words & fig.)

1934 **385 .1 (.54)**
India Railway Gazette, March, p. 57.
India's **railway budget** for 1934-35. (10 000 words.)

Institution of Civil Engineers. (London.)

1934 **385. (01**
Institut. of Civil Eng., Sessional notices, February, p. 73.
SPILLER (J. W.). — The respective merits of **roads and railways for colonial development.** (1 500 words.)

1934 **625 .143**
Institut. of Civil Eng., Sessional notices, February, p. 75.
LAW (E. F.) & HARBORD (V.). — **Steel rails.** (1 000 words.)

Indian Railway Gazette. (Calcutta.)

1934 **625 .244**
Indian Ry. Gazette, April, p. 74.
A new development in refrigerated transport. The Dyson **insulated containers.** (1 300 words.)

1934 **625 .144.4**
Indian Ry. Gazette, April, p. 78.
EAGAN (T. G. R.). — **Laying permanent-way** with the aid of 10-ton dip-lorries. Work in the desert area of Bahawalpur State. (1 500 words.)

Journal, Institution of Engineers, Australia. (Sydney, N. S. W.)

1934 **62. (01 (.94), 621 .131.3 (.94) & 625 .245 (.94)**
Journal, Institution of Engineers, Australia, February, p. 41.
SHEA (F. J.). — A modern **dynamometer car.** (6 200 words & fig.)

Journal, Institute of Transport. (London.)

1934 **621 .33**
Journal, Institute of Transport, April, p. 258.
SINCLAIR (G. F.). — Regeneration as applied to direct current electric traction. (Paper and discussion.) (17 000 words & fig.)

1934 **656 .23 & 659**
Journal, Institute of Transport, April, p. 279.
DAVIES (A.). — **The application of modern commercial practice to railways.** (7 500 words.)

Mechanical Engineering. (New York.)

1934 **536 & 621 .1 (01**
Mechanical Engineering, April, p. 207.
OSBORNE (N. S.) & MEYERS (C. H.). — A formula for the **saturation pressure of steam** in the range 0 to 374 C. (1 900 words & fig.)

1934 **621 .9**
Mechanical Engineering, April, p. 227.
Planing versus milling. (6 500 words.)

1934 **621 .11**
Mechanical Engineering, April, p. 235.
Combustion in boilers. (1 000 words.)

1934 **621 .116 & 621 .133**
Mechanical Engineering, April, p. 237.
Coal specifications. (1 100 words & fig.)

1934 **621 .116 & 621 .133**
Mechanical Engineering, April, p. 238.
Colloidal coal made from brown coal. (1 500 words)

1934 **621 .4**
Mechanical Engineering, April, p. 250.
Light-weight, high-speed passenger trains. (2 20 words & fig.)

Modern Transport. (London.)

1934 **656 .211.7 (.42**
Modern Transport, No. 784, March 24, p. 5.
Cross-Channel **train ferry service.** (1 500 words & fig.

1934 **656 (.42**
Modern Transport, No. 784, March 24, p. 2.
Rail air services (Great Britain). (1 200 words.)

1934 **621 .33 (.45**
Modern Transport, No. 785, March 31, p. 3.
New **electric railway for Italy.** The Bologna-Florenc « direct » route. (1 000 words & fig.)

1934 **656 .222.1 (.42**
Modern Transport, No. 785, March 31, p. 4.
High-speed Diesel units for long-distance service (2 200 words.)

1934 **621 .132.6 (.42**
Modern Transport, No. 785, March 31, p. 5.
Three-cylinder **tank engines** for L. M. S. Ry. (1 20 words & fig.)

1934 **656 .211.**
Modern Transport, No. 785, March 31, p. 6.
Electrical indicator for Paddington arrivals and de partures. (700 words.)

1934 **621 .39**
Modern Transport, No. 785, March 31, p. 7.
Electric welding of rolling stock. — Locomotives carriages and wagons. (2 200 words & fig.)

1934 **621 .392 (.485) & 625 .143.4 (.485**
Modern Transport, No. 785, March 31, p. 9.
Welded rail joints. — Swedish invention. (250 words.

1934 **347 .763 (.42**
Modern Transport, No. 786, April 7, p. 3.
Enhancing the safety of the roads. (2 500 words.)

1934 **656 .25 (**
Modern Transport, No. 786, April 7, p. 4.
Colour light signals. A driver's point of view. (1 20 words.)

1934 **621 .138**
odern Transport, No. 786, April 7, p. 5.
Economy in locomotive running sheds. (1 600 words.)

1934 **385 .524 (.436) & 621 .133.1 (.436)**
odern Transport, No. 786, April 7, p. 6.
STRAUSS (F.). — **Fuel consumption** on Austrian ilways. (1 400 words.)

1934 **625 .13 (.42)**
odern Transport, No. 786, April 7, p. 7.
Whitehaven tunnel. Progress of repairs. (700 words fig.)

1934 **385 .763 (.73) & 385 .3 (.73)**
odern Transport, No. 787, April 14, p. 5.
Rail and road transport in United States. (1 000 rds.)

1934 **625 .17 (.42)**
odern Transport, No. 787, April 14, p. 7.
Track maintenance on the L. N. E. Ry. (800 words fig.)

1934 **625 .216 (.42)**
odern Transport, No. 787, April 14, p. 8.
An improved drawbar cradle. (400 words & fig.)

1934 **38 & 656**
odern Transport, No. 788, April 21, p. 3.
Future of transport. Problems for the Advisory uncil. (2 400 words.)

1934 **385 .1 (.54)**
odern Transport, No. 788, April 21, p. 4.
Railways and the State in India. (2 000 words.)

1934 **656 .255**
odern Transport, No. 788, April 21, p. 5.
ROBERTS (W. S.). — **Traffic operation** over single es. Adaptability of modern token systems. (2 000 rds & fig.)

1934 **656 .211.4 (.42)**
odern Transport, No. 788, April 21, p. 9.
Terminal problems in London. (2 300 words.)

1934 **621 .132.3 (.42)**
odern Transport, No. 789, April 28, p. 3.
New three-cylinder class passenger locomotive for M. S. Ry. (1 300 words & fig.)

1934 **621 .335 (.489) & 621 .43 (.489)**
odern Transport, No. 789, April 28, p. 4.
Diesel-electric trains for Danish State Rys. (1 400 rds & fig.)

1934 **656 .27 (.54)**
odern Transport, No. 789, April 28, p. 5.
Branch line problems in India. Financial agreements th government. (2 300 words.)

Proceedings, American Society of Civil Engineers (New York.)

1934 **624 .1 & 721 .1**
Proceed., Amer. Soc. of Civil Eng., March, p. 289.
BAUMANN (P.). — Analysis of sheet-pile bulkheads. (9 100 words & fig.)

1934 **624 .51**
Proceed., Amer. Soc. of Civil Eng., March, p. 323.
STEINMAN (D. B.). — A generalized deflection theory for suspension bridges. (13 000 words & fig.)

1934 **624 .63 (.73)**
Proceed., Amer. Soc. of Civil Engineers, April, p. 485.
WILSON (W. M.). — Laboratory tests of multiple-span reinforced concrete arch bridges. (8 500 words & fig.)

Railway Age. (New York.)

1934 **625 .1 (.73)**
Railway Age, No. 10, March 10, p. 339.
Dotsero cutoff will provide new and shorter **traffic route.** (4 700 words & fig.)

1934 **621 .133.4 & 621 .133.5**
Railway Age, No. 10, March 10, p. 345.
A study of the **locomotive front end** by means of tests on a model. (1 700 words & fig.)

1934 **656 .257 (.73)**
Railway Age, No. 10, March 10, p. 347.
Automatic plant replaces **mechanical interlocking** on Alton & Southern. (1 200 words & fig.)

1934 **385 .581 (.73)**
Railway Age, No. 10, March 10, p. 353.
Railroad labor asks **six-hour day.** (5 200 words.)

1934 **625 .234 (.73)**
Railway Age, No. 10, March 10, p. 371.
More than 2 200 cars to be **air-conditioned** in 1934. (4 300 words & tables.)

1934 **347 .763 (.73)**
Railway Age, No. 11, March 17, p. 377.
Regulation of water and motor carriers recommended. (U. S. A.). (12 000 words.)

1934 **625 .2 (06 (.73)**
Railway Age, No. 11, March 17, p. 396.
American Railway Engineering Association **annual meeting** in Chicago. (24 000 words.)

1934 **656 .25 (06 (.73)**
Railway Age, No. 11, March 17, p. 413.
Signal section, American Ry. Association, meets in Chicago. (6 500 words.)

1934 **624 .7 (.71)**
Railway Age, No. 12, March 24, p. 430.
Canadian National constructs another unusual **concrete bridge.** (2 900 words & fig.)

1934 **621 .136.2 (.73)**
Railway Age, No. 12, March 24, p. 437.
Radial buffer with friction compression resistance. (900 words & fig.)

1934 **656 .22 (.73) & 656 .23 (.73)**
Railway Age, No. 12, March 24, p. 439.
Revision of merchandise service recommended. (3 300 words.)

1934 **656 .261 (.73)**
Railway Age, No. 12, March 24, p. 443.
Steady traffic growth for **railway express motor transport.** (1 100 words & fig.)

1934 **347 .763 (.73)**
Railway Age, No. 12, March 24, p. 445.
Two bus and truck regulatory bills compared. (2 600 words.)

1934 **625 .245 (.73)**
Railway Age, No. 13, March 31, p. 462.
Pennsylvania builds new **automobile and flat cars.** (1 400 words & fig.)

1934 **625 .17 (.73)**
Railway Age, No. 13, March 31, p. 465.
PHILLIPS (G. A.). — Proper investment and modern methods will yield a return. (4 200 words & fig.)

1934 **656 .284 (.73)**
Railway Age, No. 13, March 31, p. 475.
Centralized traffic control installed on the Baltimore & Ohio. (1 500 words & fig.)

1934 **625 .142.2 & 691**
Railway Age, No. 14, April 7, p. 496.
Burlington discovers evidence of **termite damage.** (4 900 words & fig.)

1934 **385 .1 (.73)**
Railway Age, No. 14, April 7, p. 501.
Railway inventaries reduced to $ 295 000 000. (3 100 words & 4 tables.)

1934 **621 .133.7 (.73)**
Railway Age, No. 14, April 7, p. 507.
von BERGEN (E.). — Illinois Central improves method of **handling boiler water.** (2 400 words & fig.)

1934 **621 .335 (.73) & 621 .43 (.73)**
Railway Age, No. 15, April 14, p. 533.
Burlington « **Zephyr** » completed at Budd plant. (7 200 words & fig.)

1934 **385. (072**
Railway Age, No. 15, April 14, p. 545.
POTTER (A. A.). — Analyzing the **railroad research problem.** (3 400 words & fig.)

1934 **656 .29 (.73)**
Railway Age, No. 15, April 14, p. 549.
An **automatic wheel counter** on the Union Pacific. (1 100 words & fig.)

Railway Engineer. (London.)

1934 **621 .4**
Railway Engineer, April, p. 103.
Railcars. (1 200 words.)

1934 **625 .143.2 (.73**
Railway Engineer, April, p. 104.
ALLEN (C. J.). — The **steel rail specification** of th American Railway Engineering Association. (2 90 words & 1 table.)

1934 **621 .132.1 (.44**
Railway Engineer, April, p. 106.
Development of the steam locomotive in France (1 700 words.)

1934 **621 .4**
Railway Engineer, April, p. 108.
TRITTON (J. S.). — **Railcars.** A comprehensiv review of the problems of handling railway traffic b light railcar units. (5 400 words & fig.)

1934 **624. (0 & 624**
Railway Engineer, April, p. 116.
Straight-girder **reinforced-concrete bridges** for lon spans. (1 500 words & fig.)

1934 **621 .135.1 & 621 .13**
Railway Engineer, April, p. 118.
A clear engine **cab outlook.** (900 words & fig.)

1934 **621 .392 & 625 .23**
Railway Engineer, April, p. 120.
BONDY (O.). — **Welding** in the construction passenger coaches. (1 900 words & fig.)

1934 **624 .3 (.54**
Railway Engineer, April, p. 124.
EVERALL (W. T.). — The Indus **bridge** at Kalabag North Western Railway, India. Part II. — **Girde erection.** (1 600 words & fig.)

1934 **625 .143 (.44**
Railway Engineer, April, p. 130.
125-lb. rails in France. (800 words & fig.)

Railway Engineering and Maintenance. (Chicago.)

1934 **625 .17 (.73**
Railway Engineering and Maintenance, March, p. 13
In what condition is **work equipment** to-day ? (3 20 words & fig.)

1934 **385 .586 (.73), 625 .144.4 (.73 & 625 .17 (.73**
Railway Engineering and Maintenance, March, p. 13
Should we use less machines and more men ? (2 20 words & fig.)

1934 **625 .144.4**
ailway Engineering and Maintenance, March, p. 141.
Quality or price, which should govern ? (3 900 words fig.)

1934 **625 .141, 625 .144.4 & 625 .173**
ailway Engineering and Maintenance, March, p. 144.
HOWARD (N. D.). — Economical **track maintenance** emands clean ballast. (5 000 words & fig.)

1934 **625 .15**
ailway Engineering and Maintenance, April, p. 200.
Special **trackwork.** (4 500 words & fig.)

1934 **721 .2**
ailway Engineering and Maintenance, April, p. 204.
DISNEY (C. P.). — **Crib retaining walls versus solid** asonry. (800 words & fig.)

1934 **625 .174 (.73)**
ailway Engineering and Maintenance, April, p. 205.
Switch heaters solve winter problem at North tation. (3 600 words & fig.)

1934 **624. (0 (.73)**
ailway Engineering and Maintenance, April, p. 209.
Pier deck of black gum promises long life. (2 500 ords & fig.)

1934 **725 .33 (.73)**
ailway Engineering and Maintenance, April, p. 213.
Modern equipment reduces **cost of water.** (2 400 words fig.)

1934 **625 .174 (.73)**
ailway Engineering and Maintenance, April, p. 216.
Long Island Railroad to increase **snow-fighting equip-** ent. (2 200 words & fig.)

Railway Gazette. (London.)

1934 **625 .14**
ailway Gazette, No. 12, March 23, p. 485.
The **steel rail** — past, present and future. (700 ords.)

1934 **656 .256 (.42)**
ailway Gazette, No. 12, March 23, p. 492.
A new type of **rectifier controlled track circuit.** (750 ords & fig.)

1934 **621 .43 (.82)**
ailway Gazette, No. 12, March 23, p. 496.
Ten-ton rail motor car for the Argentine North-astern Railway. (500 words & fig.)

1934 **656 .23 (.43) & 659 (.43)**
ailway Gazette, No. 13, March 30, p. 535.
Winning back traffic in Germany. (1 000 words.)

1934 **385. (091 (.52)**
ailway Gazette, No. 13, March 30, p. 541.
Japanese Government Railways. — Recent activities nclude the boring of a great **tunnel.** (850 words & fig.)

1934 **385 .4 (.42), 656 .212 (.42) & 656 .23 (.42)**
Railway Gazette, No. 13, March 30, p. 542.
PAYNE (H. W.). — Keeping abreast of the times in the goods department. (1 800 words & fig.)

1934 **621 .132.6 (.42)**
Railway Gazette, No. 13, March 30, p. 547.
New **three-cylinder 2-6-4 passenger tank engines,** L. M. S. Ry. (1 300 words & fig.)

1934 **656 .25 (.44)**
Railway Gazette, No. 14, April 6, p. 566.
Signalling on the P. L. M. (France). (1 600 words.)

1934 **621 .134.1 & 669**
Railway Gazette, No. 14, April 6, p. 574.
Duralumin connecting rods. (750 words & fig.)

1934 **693**
Railway Gazette, No. 14, April 6, p. 576.
Demonstration of a new **fire-proofing composition.** (1 200 words & fig.)

1934 **625 .13 (.42)**
Railway Gazette, No. 14, April 6, p. 578.
Repairs to Whitehaven **tunnel,** L. M. S. Ry. (650 words & fig.)

1934 **656 .211.5 (.42)**
Railway Gazette, No. 14, April 6, p. 579.
New **train indicator** at Paddington, G. W. Ry. (1 200 words & fig.)

1934 **656 .212 (.42), 656 .225 (.42) & 656 .23 (.42)**
Railway Gazette, No. 14. April 6, p. 582.
PAYNE (H. W.). — Keeping abreast of the times in the goods department. (2 000 words & fig.)

1934 **621 .138**
Railway Gazette, No. 15, April 13, p. 629.
More economical **locomotive working.** (1 000 words.)

1934 **656 .212, 656 .22 & 656 .23**
Railway Gazette, No. 15, April 13, p. 630.
PAYNE (H. W.). — Keeping abreast of the times in the goods department. (1 700 words & fig.)

1934 **656 .261**
Railway Gazette, No. 15, April 13, p. 635.
The Latil K. T. L. traulier. (1 000 words & fig.)

1934 **625 .172**
Railway Gazette, No. 16, April 20, p. 668.
Automatic recording of vertical track defects. (2 700 words & fig.)

1934 **625 .232 (.44)**
Railway Gazette, No. 16, April 20, p. 673.
New light-weight Italian coaches. (700 words & fig.)

1934 **625 .232 (.494)**
Railway Gazette, No. 17, April 27, p. 718.
Double deck Swiss sleeping cars. (500 words & fig.)

1934 **625 .143.4 (.73)**
Railway Gazette, No. 17, April 27, p. 719.
New U. S. A. standard **fish plates.** (Fig.)

1934 **656 .253 (.42)**
Railway Gazette, No. 17, April 27, p. 721.
Changing over from **manual to power signalling** at Cardiff. (2 600 words & fig.)

1934 **725 .31 (.45)**
Railway Gazette, No. 17, April 27, p. 726.
The new Florence-Bologna Direttissima. Designs for the new Florence station. (2 100 words & fig.)

1934 **621 .132.3 (.42)**
Railway Gazette, No. 17, April 27, p. 728.
New **three-cylinder express locomotives,** L. M. S. R. (500 words & fig.)

1934 **621 .43 (.44)**
Diesel Ry. Traction, p. 514, Supplt. to the Ry. Gazette, March 23.
A successful French **railcar.** (1 800 words & fig.)

1934 **621 .43 (.42)**
Diesel Ry. Traction, p. 517, Supplt. to the Ry. Gazette, March 23.
Shunting locomotive for the Great Western Railway (England). (600 words & fig.)

1934 **621 .43**
Diesel Ry. Traction, p. 518, Supplt. to the Ry. Gazette, March 23.
Busch-Sulzer engine. — Further particulars of the world's largest locomotive **Diesel engine.** (800 words.)

1934 **621 .43 (.43)**
Diesel Ry. Traction, p. 520, Supplt. to the Ry. Gazette, March 23.
German **railcar** with twelve-cylinder engine. (1 500 words & fig.)

1934 **621 .43 (.42)**
Diesel Ry. Traction, p. 523, Supplt. to the Ry. Gazette, March 23.
L. M. S. Ry. **railcar trial.** (600 words & fig.)

1934 **621 .335 (.492) & 621 .43 (.492)**
Diesel Ry. Traction, p. 524, Supplt. to the Ry. Gazette, March 23.
Dutch **Diesel trains.** (1 200 words & fig.)

1934 **621 .335 (.73) & 621 .43 (.73)**
Diesel Ry. Traction, p. 526, Supplt. to the Ry. Gazette, March 23.
A novel **Diesel locomotive.** (900 words & fig.)

1934 **621 .43 (.44)**
Diesel Ry. Traction, p. 528, Supplt. to the Ry. Gazette, March 23.
First **Diesel car** on the Nord. (400 words & fig.)

1934 **621 .43 (.4**
Diesel Ry. Traction, p. 529, Supplt. to the Ry. Gazet March 23.
Locomotive for Government service. (700 words & fi

1934 **621 .43 (.48**
Diesel Ry. Traction, p. 530, Supplt. to the Ry. Gazet March 23.
Express Diesel railcars. (400 words & fig.)

1934 **621 .43 (.4**
Diesel Ry. Traction, p. 690, Supplt. to the Ry. Gazet April 20.
Diesel vehicle performance. I. — L.M.S.R. 150 b. h. **shunting locomotive.** (1 300 words & fig.)

1934 **621 .43 (.49**
Diesel Ry. Traction, p. 692, Supplt. to the Ry. Gazet April 20.
Dutch Diesel tractors. (300 words & fig.)

1934 **621 .335 (.42) & 621 .43 (.4**
Diesel Ry. Traction, p. 693, Supplt. to the Ry. Gazet April 20.
Power station shunting. (600 words & fig.)

1934 **621 .**
Diesel Ry. Traction, p. 694, Supplt. to the Ry. Gazet April 20.
STUART MIALL. — Transmissions for **shunting loc motives.** (1 100 words & fig.)

1934 **621 .335 (.42) & 621 .43 (.4**
Diesel Ry. Traction, p. 696, Supplt. to the Ry. Gazet April 20.
GARRISON (W. L.). — **Oil-electric locomotives** steel mill transportation. (3 500 words & fig.)

1934 **621 .335 (.73) & 621 .43 (.7**
Diesel Ry. Traction, p. 702, Supplt. to the Ry. Gazet April 20.
Heavy shunting results. (1 200 words, 2 tables & fig

1934 **621 .43 (.7**
Diesel Ry. Traction, p. 704, Supplt. to the Ry. Gazett April 20.
The latest British **shunting locomotive.** (900 wor & fig.)

1934 **621 .335 (.73) & 621 .43 (.7**
Diesel Ry. Traction, p. 706, Supplt. to the Ry. Gazett April 20.
Diesel engine starting. (800 words & fig.)

1934 **385 .113 (.4**
Supplement to the Ry. Gazette, April 27.
Financial and operating results of the British Gro Railways in 1933. (6 000 words & 28 tables.)

1934 **621 .**
Electric Ry. Traction, p. 602, Supplt. to the Ry. Gazett April 6.
CORTEZ LEIGH (F. A.). — Thirty years of railwa **electrification.** (2 800 words & fig.)

1934 **621 .33 (.42)**
ectric Ry. Traction, p. 605, Supplt. to the Ry. Gazette, April 6.
The development of **electric traction** in Britain. (1 800 rds & fig.)

1934 **621 .33 (.42)**
ectric Ry. Traction, p. 608, Supplt. to the Ry. Gazette, April 6.
Lancashire **electrified lines** of the L. M. S. Ry. (4 500 rds & fig.)

1934 **621 .33 (.42)**
ectric Ry. Traction, p. 615, Supplt. to the Ry. Gazette, April 6.
The Tyneside electrified area of the L. N. E. R. (1 400 rds & fig.)

1934 **621 .331 (.42)**
ectric Ry. Traction, p. 617, Supplt. to the Ry. Gazette, April 6.
Modernisation of Newport-Shildon line. (900 words fig.)

Railway Magazine. (London.)

1934 **656 .222.1 (.42)**
ilway Magazine, April, p. 244.
ALLEN (C. J.). — **British locomotive practice and rformance.** (4 000 words & 2 tables.)

1934 **385. (091 (.481)**
ilway Magazine, April, p. 255.
Railway developments in Norway. (1 900 words fig.)

1934 **385. (09 (.43)**
ilway Magazine, May, p. 313.
SCHWARZENSTEIN (F. F.) — **Centenary and velopment of the German Railways.** (2 400 words & .)

1934 **656 .222.1 (.42)**
ilway Magazine, May, p. 318.
Modern locomotive work in France. I. — Chemins de r Paris-Orléans-Midi. II. — Chemins de fer d'Alsace-rraine. (3 200 words, 1 table & fig.)

1934 **656 .222.1 (.42)**
ilway Magazine, May, p. 323.
ALLEN (C. J.). — **British locomotive practice and rformance.** (4 600 words & fig.)

Railway Mechanical Engineer. (New York.)

1934 **625 .234 (.73)**
ilway Mechanical Engineer, March, p. 75.
VERBARG (L. J.). — What price **air conditioning?** 200 words & fig.)

1934 **621 .135. (01**
ilway Mechanical Engineer, March, p. 79.
FRY (L. H.). — **Locomotive counterbalancing.** (3 000 rds & fig.)

1934 **621 .43 (.73)**
Railway Mechanical Engineer, March, p. 82.
Burgess mufflers used on railplane. (250 words & fig.)

1934 **62. (01 & 625 .246**
Railway Mechanical Engineer, March, p. 83.
The effect of sulphur on **aluminium cars.** (1 000 words & fig.)

1934 **621 .138 & 621 .139**
Railway Mechanical Engineer, March, p. 84.
ANDERSON (J. A.). — **Budgeting locomotive department expenditures.** (1 600 words.)

1934 **625 .26 (.73)**
Railway Mechanical Engineer, April, p. 107.
STECK (J. W.). — Progressive repairing of **gondola cars.** (3 200 words & fig.)

1934 **625 .216 (.73)**
Railway Mechanical Engineer, April, p. 110.
Radial buffer with friction compression resistance. (900 words & fig.)

1934 **625 .234**
Railway Mechanical Engineer, April, p. 112.
TUCKER (W. H.). — Developments in **heating passenger-train cars.** (3 100 words.)

1934 **625 .251**
Railway Mechanical Engineer, April, p. 114.
The friction of railway **brake shoes.** (1 900 words & fig.)

1934 **656 .24**
Railway Mechanical Engineer, April, p. 117.
Draft gear, cinders, and some other things. (1 300 words & fig.)

1934 **621 .335 (.492) & 621 .43 (.492)**
Railway Mechanical Engineer, April, p. 118.
Forty **Diesel-electric trains** for the Netherlands Railways. (1 000 words & fig.)

Railway Signaling. (Chicago.)

1934 **656 .254 (.73) & 656 .257 (.73)**
Railway Signaling, March, p. 125.
Remote control of end of double track on the Delaware and Hudson. (2 300 words & fig.)

1934 **656 .258 (.73)**
Railway Signaling, March, p. 128.
Electro-pneumatic **interlocking** on the Long Island. (3 000 words & fig.)

1934 **621 .39 (.73) & 656 .25 (.73)**
Railway Signaling, March, p. 131.
JENSEN (O. M.). — **Rectifiers** with primary battery. (2 000 words & fig.)

1934 **656 .254 (.73)**
Railway Signaling, March, p. 133.
Centralized traffic control installed on the Baltimore and Ohio. (2 600 words & fig.)

1934 **656 .256.3 (.73) & 656 .258 (.73)**
Railway Signaling, March, p. 136.
Automatic interlockings on the Santa Fe. (2 300 words & fig.)

1934 **656 .25 (06 (.73)**
Railway Signaling, March, p. 139.
Annual meeting of signal section, American Railway Association. — Proceedings of Chicago meeting dealt with economics, new apparatus and crossing protection. (16 000 words.)

1934 **656 .256.3 (.73)**
Railway Signaling, April, p. 187.
Automatic plant replaces mechanical interlocking on Alton and Southern. (1 200 words & fig.)

1934 **656 .256.3 (.73)**
Railway Signaling, April, p. 189.
New **signaling** on the Reading. (800 words & fig.)

1934 **656 .256.2 (.73)**
Railway Signaling, April, p. 196.
Simplified **interlocking** speeds train operation. (2 700 words & fig.)

1934 **656 .25**
Railway Signaling, April, p. 199.
BAIRD (M. A.). — **Primary battery life on the Erie.** (1 100 words & fig.)

1934 **691**
Railway Signaling, April, p. 201.
MEYERS (R. E.). — Preservative treatment and line service of **creosoted poles.** (1 700 words & fig.)

South African Railways and Harbours Magazine. (Johannesburg.)

1934 **625 .232 (.68)**
South Afric. Rys. and Harbours Magazine, February, p. 132.
Building **railway coaches** in record time (S. A. Rys. and H.). (1 600 words & fig.)

The Locomotive. (London.)

1934 **621 .132.6 (.42)**
The Locomotive, No. 500, April 14, p. 102.
Three-cylinder **2-6-4 passenger tank engine,** L. M. and S. Ry. (1 400 words & fig.)

1934 **621 .132.3 (.438)**
The Locomotive, No. 500, April 14, p. 104.
Mikado type **express engines,** Polish State Railways. (800 words & fig.)

1934 **621 .131.2**
The Locomotive, No. 500, April 14, p. 106.
Project for a locomotive of high capacity. (750 words & fig.)

1934 **313 : 621 .13 (.**
The Locomotive, No. 500, April 14, p. 113.
Locomotive stock returns 1933. (750 words & 1 tab

1934 **621 .43 (.**
The Locomotive, No. 500, April 14, p. 115.
Saloon **rail-car** for Venezuela. (1 000 words & fig.

1934 **621 .132.3 (.**
The Locomotive, No. 500, April 14, p. 117.
Simple expansion express locomotive Northern R
way of France. (1 800 words & fig.)

1934 **625 .232 (.43) & 625 .235 (.**
The Locomotive, No. 500, April 14, p. 120.
Welded light weight German coaches. (900 wo
& fig.)

Transit Journal. (New York.)

1934 **625 .4 (.73) & 656 .254 (.**
Transit Journal, March, p. 82.
Centralized control for subway signals. (2 800 wo
& fig.)

1934 **625 .251 & 625 .**
Transit Journal, March, p. 88.
Retardation controller-development. (900 words & f

1934 **621 .**
Transit Journal, April, p. 109.
CLARK (F.S.). — **Graphical location of trolley w**
(2 300 words & fig.)

1934 **625 .26 (.73) & 625 .62 (.**
Transit Journal, April, p. 112.
Centralized car inspection successful. (3 500 wo
& fig.)

1934 **621 .338 (.**
Transit Journal, April, p. 115.
Chicago gets first surface line sample car. (1 000 wo
& fig.)

1934 **621 .338 (.**
Transit Journal, April, p. 117.
Five-section car of stainless steel (New York Ra
Transit Company). (3 000 words & fig.)

In Spanish.

Anales de la Asociación de Antiguos Alumn del I. C. A. I. (Madrid.)

1934
Anales de la Asociación de Antiguos Alumnos del I.
A. I., marzo, p. 131.
JACKSON (L.) & LLANOS (S.). — Estudio com
rativo de los sistemas de explotación de una **línea**
transporte urbana. (1 600 palabras, 3 cuadros & fig.

Caminos de hierro. (Madrid.)

934 **385 .1**

inos de hierro, marzo, p. 58.

IONREAL (M.) & CASTILLO (M.). — Considera-es sobre la crisis ferroviaria y sus posibles reme-s. (800 palabras.)

Ferrocarriles y Tranvias. (Madrid.)

934 **625 .172**

rocarriles y Tranvias, marzo, p. 122.

EYES (E. G.). — El « soufflage mesuré ». (4 000 abras & fig.)

934 **621 .13 & 621 .43**

rocarriles y Tranvias, marzo, p. 132.

EDER (G.). — j Automotores o locomotoras peque-? (1 500 palabras & fig.)

934 **625 .2 (01**

rocarriles y Tranvias, marzo, p. 135.

ARUTELL (C.). — Formas aerodinámicas en vehí-os terrestres. (2 700 palabras & fig.)

Los Transportes. (Madrid.)

934 **656 .23 (0**

Transportes, nº 372, 15 marzo, p. 86.

eorética del tráfico. (2 400 palabras.)

Revista de Ingenieria Industrial. (Madrid.)

934 **625 .213**

ista de Ingenieria industrial, marzo, p. 82.

AFFITTE (C.). — El funcionamiento de la suspen-de vehículos. (3 900 palabras & fig.)

Revista de Obras Publicas. (Madrid.)

934 **624**

ista de Obras Públicas, nº 6, 15 de marzo, p. 101; nº 7, 1º de abril, p. 121.

ASADO (C. F.). — Colección de puentes de altura icta. (3 300 palabras & fig.)

934 **625 .13 (.460)**

ista de Obras Públicas, nº 6, 15 de marzo, p. 105.

IONEVA (F.). — Las obras de reconstrucción del rto paso sobre el río Matarraña, en la línea de agoza a Barcelona por Caspe. (3 800 palabras & fig.)

934 **656 .2**

ista de Obras Públicas, nº 7, 1º abril, p. 129.

RANGO (L. R.). — Facetas ferroviarias. (6 300 pa-as.)

934 **624**

ista de Obras Públicas, nº 8, 15 de abril, p. 141.

ASADO (C. F.). — Colección de puentes de altura icta. (1 100 palabras & fig.)

In Italian.

La tecnica professionale. (Firenze.)

1934 **621 .134.1**

La tecnica professionale, aprile, p. 105.

DIEGOLI (M.). — I cuscinetti delle bielle nelle locomotive veloci. (2 900 parole & fig.)

L'Ingegnere. (Roma.)

1934 **624 .2**

L'Ingegnere, nº 6, 16 marzo, p. 267.

CASATI (E.). — Sulla determinazione della verticale di separazione dei carichi per le aste di parete nelle travi reticolari da ponte. (400 parole & fig.)

1934 **624 .2**

L'Ingegnere, nº 6, 16 marzo, p. 269.

STABILINI (L.). — Un metodo semplice per il tracciamento di deformate. (1 000 parole & fig.)

1934 **621 .335 & 621 .43**

L'Ingegnere, nº 8, 16 aprile, p. 366.

BRUNNER (A.). — Treni rapidi Diesel-elettrici. (3 500 parole & fig.)

Rivista tecnica delle ferrovie italiane. (Roma.)

1934 **625 .13 (.45)**

Rivista tecnica delle ferrovie italiane, 15 marzo, p. 101.

ORLANDINI (E.). — La ricostruzione del ponte « Torello » sul fiume Calore al km. 138,746 della linea Foggia-Napoli. (4 200 parole & fig.)

1934 **656 .237**

Rivista tecnica delle ferrovie italiane, 15 marzo, p. 112.

MALTESE (S.). — Un documento di trasporto ferroviario negoziabile. (5 800 parole.)

1934 **621 .33 (.439)**

Rivista tecnica delle ferrovie italiane, 15 marzo, p. 123.

BAJOCCHI (U.). — Il sistema Kandó. La elettrificazione della ferrovia meridionale Budapest-Vienna. (20 500 parole & fig.)

In Dutch.

De Ingenieur. (Den Haag.)

1934 **656 .1 & 625 .62**

De Ingenieur, nº 12, 23 Maart, p. V. 17.

BAKKER SCHUT (P.). — Tram of bus? (2 100 woorden & fig.)

1934 **656 .1 (.92) & 656 .2 (.92)**

De Ingenieur, nº 13, 30 Maart, p. V. 23.

VAN KREEL (B. H. A.). — Spoor- en autoverkeer ter Oostkust van Sumatra. (10 000 woorden & fig.)

1934 **62. (01 & 624**

De Ingenieur, n° 14, 6 April, p. A. 124.

VAN ITERSON (F. K. Th.). — Plastisch of onelastisch knikken. (3 300 woorden & fig.)

1934 **691**

De Ingenieur, n° 14, 6 April, p. Bt. 27.

BOONSTRA (G. C.). — Onderzoeck van onder water gestort beton (4 800 woorden & fig.)

1934 **621 .33 (.492)**

De Ingenieur, n° 15, 13 April, p. V. 35.

PLOMP (A.). — De werken voor de electrificatie van den spoorweg Rotterdam-Dordrecht. (6 000 woorden & fig.)

1934 **621 .33 (.492) & 625 .13 (.492)**

De Ingenieur, n° 15, 13 April, p. V. 44.

SLOTHOUWER (J. F. A.). — Electrificatie Rotterdam-Dordrecht. Vernieuwing van de viaduct bij Rotterdam-Beurs. (6 000 woorden & fig.)

1934 **62. (01 & 691**

De Ingenieur, n° 16, 20 April, p. B. 45.

FRANX (C.). — Proefbelasting van een Frankipaal en van eenige andere paalsoorten te Rotterdam. (3 000 woorden, 2 tabellen & fig.)

1934 **721 .9**

De Ingenieur, n° 16, 20 April, p. B, 49.

VAN DAALEN. — Een fundeeringsmethode met op kleef werkende gewapend betonpalen. (3 000 woorden, 2 tabellen & fig.)

Spoor- en Tramwegen. (Utrecht.)

1934 **656 .225 (.492)**

Spoor en Tramwegen, n° 7, 27 Maart, p. 161.

BOOT (B. C. M.). — Steeds sneller en betrouwbaarder, maar niet duurder. (3 200 woorden & fig.)

1934 **656 .253 (.4**

Spoor en Tramwegen, n° 7, 27 Maart, p. 165.

Beschouwingen over de toepassing van dag-lic seinen. (3 400 woorden & fig.)

1934 **656 .225 (.4**

Spoor en Tramwegen, n° 8, 10 April, p. 190.

BOOT (B. C. M.). — Steeds sneller en betrouwba der, maar niet duurder. (4 100 woorden & fig.)

1934 **656 .212.5 (.4**

Spoor en Tramwegen, n° 9, 24 April, p. 217.

VAN DER WAL (N. J. H.) & PENTINGA (K. J.). Rangeeren met groepswagens. (2 800 woorden & fig.

1934 **625 .14**

Tram en Spoorwegen, n° 9, 24 April, p. 224.

LIESE (E.). — Über die Brauchbarkeit von Buchholz als Schwellenmaterial. (2 300 woorden & fig.)

In Portuguese.

Gazeta dos Caminhos de ferro. (Lisboa.)

1934 **385. (01 (**

Gazeta dos caminhos de ferro, n° 1110, 16 de ma p. 149.

GALVAO (L.). — Os caminhos de ferro coloni (2 600 palavras.)

1934 **624 (.4**

Gazeta dos caminhos de ferro, n° 1111, 1. de ab p. 177.

DE SOUSA (J. F.). — A ponte sobre o Tejo. (6 palavras.)

1934 **625 .1 (.4**

Gazeta dos caminhos de ferro, n° 1112, 16 de ab p. 215.

Construçoes ferroviarias. A linha de cintura do Po (1 400 palavras & fig.)

ERRATUM.

Bulletin, May 1934.

Monthly Bibliography : page 69, 2nd column. Notice on the following book : **Statistique des Chemins de fer suisses.**

Instead of — Price : 10 francs français,

Read : Price : 10 francs suisses.

M. Weissenbruch Co., Ltd., Printer of the King, 49, rue du Poinçon, Bruxelles.

VOL. XVI — N° 6

JUNE 1934

Monthly Bulletin of the International Railway Congress Association

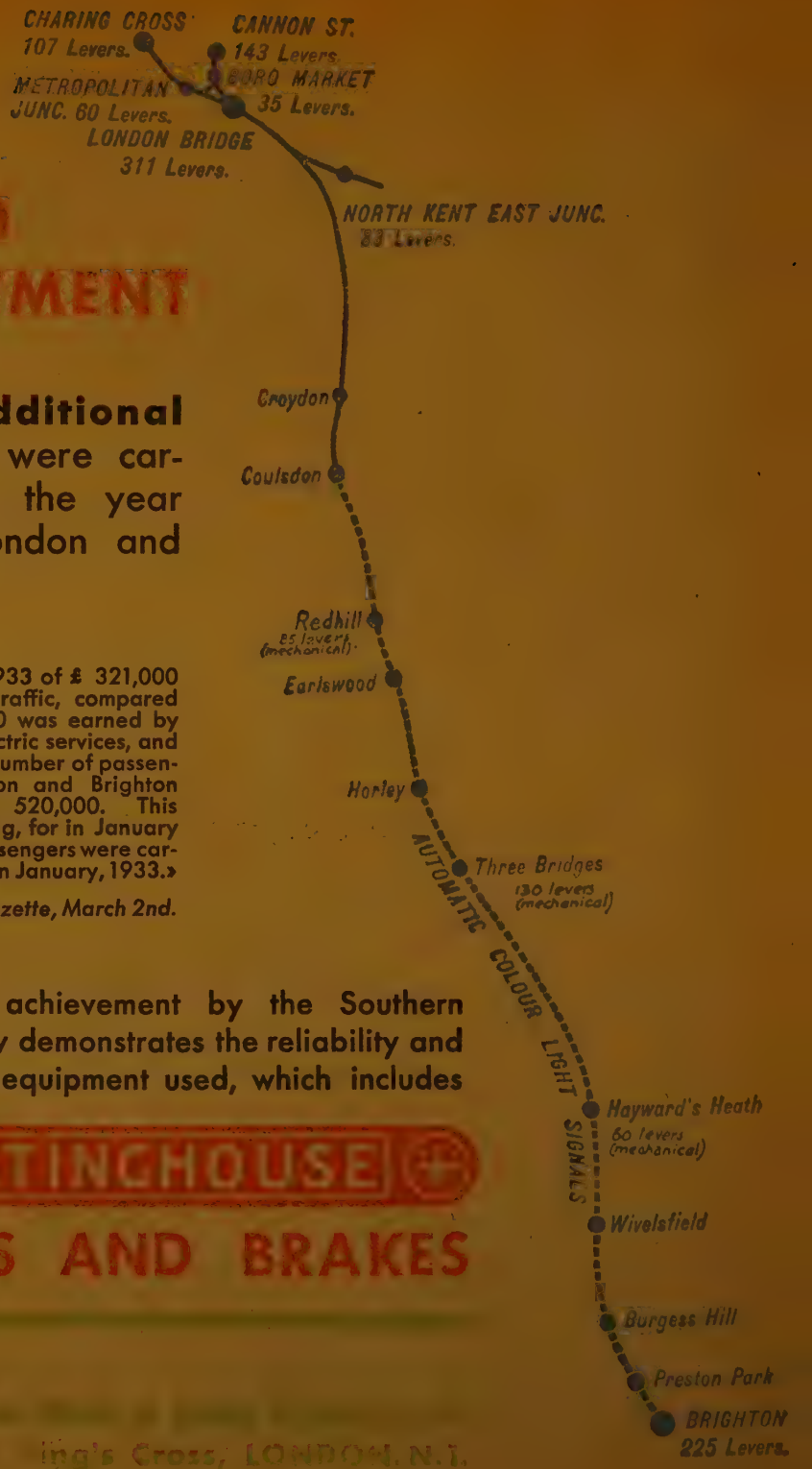
(English Edition)

A SOUND INVESTMENT

« 520,000 **additional**
« passengers were car-
« ried during the year
« between London and
« Brighton.

« Of the increase in 1933 of £ 321,000
« in passenger train traffic, compared
« with 1932, £ 150,000 was earned by
« the new Brighton electric services, and
« during the year the number of passen-
« gers between London and Brighton
« alone increased by 520,000. This
« traffic is still improving, for in January
« last 110,000 more passengers were car-
« ried in this area than in January, 1933.»

—The Railway Gazette, March 2nd.



This wonderful achievement by the Southern Railway Company demonstrates the reliability and efficiency of the equipment used, which includes

WESTINGHOUSE

SIGNALS AND BRAKES

ing's Cross, LONDON, N.1.

WESTINGHOUSE BRAKED

The new diesel-electric train for the San Paulo Railway, built by Sir W. G. Armstrong-Whitworth & Co. (Engineers) Ltd., is fitted with Westinghouse Automatic Vacuum Brakes and Control Equipment. Driver's Brake Valves and deadman's Emergency Valves interlocked with the electric controller are provided at both ends of the train. Brake force on all bogies in obtained with

WESTINGHOUSE

Trade "PRESTALL" Mark

STEEL VACUUM BRAKE

CYLINDERS

"Prestall" cylinders were specified also for the 250 Wagons (100 30-ton and 150 16-ton) now being built for the San Paulo Railway. These **REPEAT ORDERS** demonstrate the efficiency and satisfaction given by the first 80 "Prestall" Cylinders supplied to the San Paulo Railway in 1930.

Specify "Prestall" and save 40 % in dead weight

THE WESTINGHOUSE BRAKE & SAXBY SIGNAL CO. LTD., 82, York Road, LONDON, N. I.
In AUSTRALIA : The Westinghouse Brake Co. of Australasia Ltd. Concord West, N. S. W.
In INDIA : Saxby & Farmer (India) Ltd., Entally, Calcutta.

WESTINGHOUSE BRAKED

One of four Diesel Electric Locomotives built by Messrs. **Sir W.G. Armstrong Whitworth & Co.** (Engineering), **Ltd.,** for the Gaekwar's Baroda State Railways. (Consulting Engineers, Messrs. **Rendell, Palmer and Tritton.**)

These are fitted with

WESTINGHOUSE

AIR BRAKES

There are many types of **Westinghouse Equipments,** covering every requirement for all kinds of rolling stock.

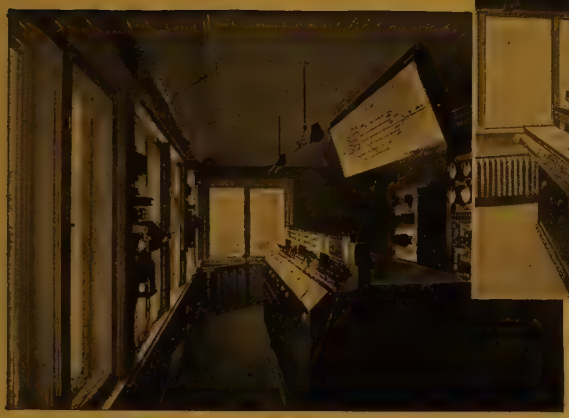
Modern Equipments

of the latest design include :--

The Empty and Load Brake for freight trains. The Electro-pneumatic Brake for intensive service passenger lines. The 6 E.T. Automatic and Straight Air Brake for Steam Locomotives. The 14 E.L. Automatic and Straight Air Brake for Electric Locomotives. The Cross-Compound Air Compressor. The "Comprestall" Steel Brake Cylinder. The Self-Lapping Straight Air Brake Valve for Railcars, Tramways, etc., etc., etc.

THE WESTINGHOUSE BRAKE & SAXBY SIGNAL CO. LTD., 82, York Road, LONDON, N.1.
In AUSTRALIA : The Westinghouse Brake Co. of Australasia Ltd. Concord West, N. S. W.
In INDIA : Saxby & Farmer (India) Ltd., Entally, Calcutta.

VEREINIGTE EISENBAHN-SIGNALWERKE G. M. B. H. BERLIN-SIEMENSSTADT



The most northerly Power Frame in the World at Narvik (Norway)

Semi-Automatic Power Frame at the Station "Ausstellung", Berlin

MECHANICAL INTERLOCKING FRAMES

Signal and Point Mechanisms for Wire and Rod Working — Compensators for Wire Transmissions — Point Detectors — Time Locks — Level Crossing Barriers — Electric Slots on Signal Arms — Crank Handle Locking Frames — Lever Locking Frames — Rail-Contacts

ELECTRIC INTERLOCKING FRAMES

with German and American Pattern Locking Boxes — Signal and Point Machines for Direct or Alternating Current — Electric Point Detection — Motor operated Detector Bolts — Semaphore Signals — Day Colour Light Signals

BLOCK SIGNALLING, NON-AUTOMATIC

Block Signals — Block Instruments — Electric Plunger Locks for Block Instruments — Track Circuiting and other apparatus for indicating the condition of the line

AUTOMATIC BLOCK SIGNALLING

Impedance Bonds — Track Relays — Illuminated Track Diagrams — Level Crossing Signals

AUTOMATIC GRAVITY HUMP YARD INSTALLATIONS

Desk Pattern Power Locking Frames — Magazine Apparatus for Automatic Point Operating

AUTOMATIC TRAIN CONTROL

mechanical (Train Stops) — inductive

VES

WORKS IN BERLIN-SIEMENSSTADT, BRAUNSCHWEIG, BRUCHSAL, GEORGSMARIENHTTÜE

DEMAG ELECTRIC BLOCKS

with creeping speed for quickly and accurately clamping work-pieces and for carefully assembling individual parts during erections and repairs. Carrying capacity 1/4 to 9 tons.

Demag Suspension Cranes

having a carrying capacity up to 3 tons, reliably and economically operating quick hoists, the light overhead travelling cranes for stores and workshops.

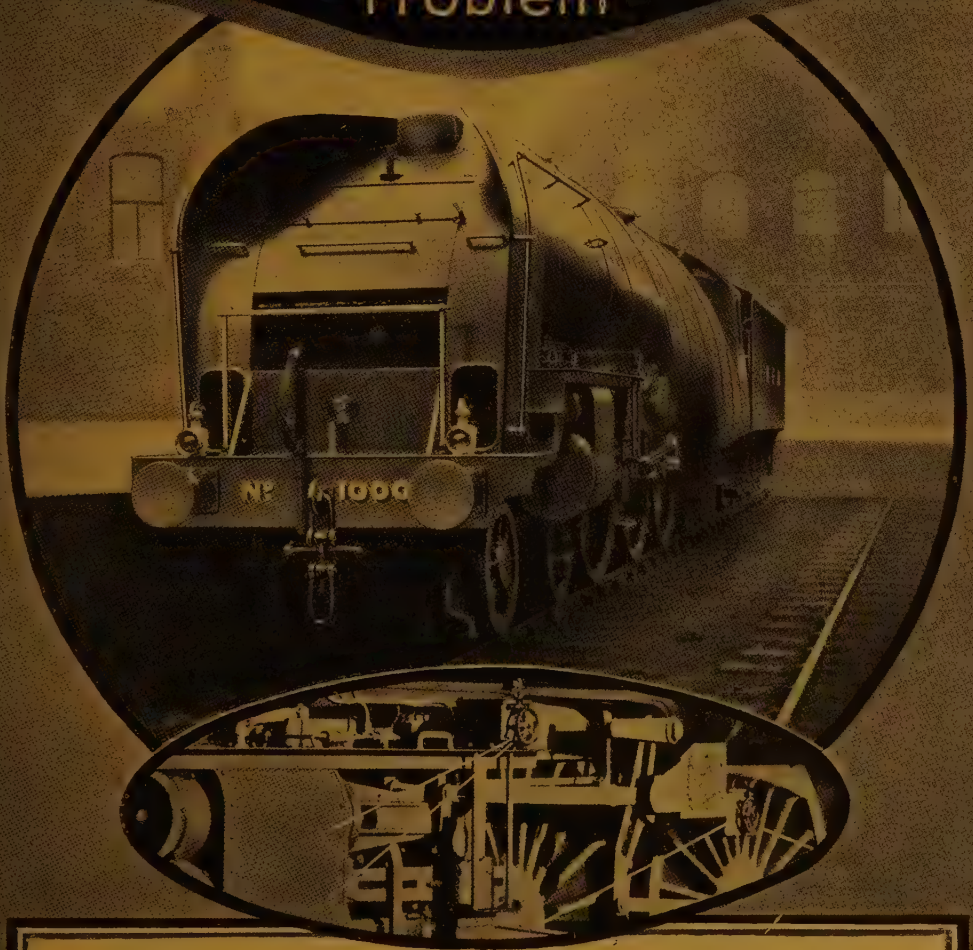
DEMAG

DUISBURG

Agencies:

Great-Britain : E. Hafels, 12, Victoria Street, **London S.W.1.**
France : H. Hamelle, 21-23, boulevard Jules Ferry, **Paris**
Belgium : Ing. A. Rosengarde, 195-197, avenue de la Couronne, **Brussels**
Italy : Demag, Soc. an. Italiana, Via Benedetto Marcello, 33, **Milan**
Spain : Maquinaria Demag, S. L., A. de Recalde, 38, **Bilbao**
Switzerland : G. Bäumlin, **Lucerne,** Postfach
Austria : Ing. R. Altmann, Brucknerstr., 4, **Vienna**

High Pressure Steam
-and the Lubrication Problem



THE L.N.E.R. 4- CYLINDER COMPOUND EXPRESS LOCOMOTIVE depicted above, fitted with high pressure Yarrow-Gresley boiler, is equipped with WAKEFIELD No 7 pattern Mechanical Lubricators for valves, cylinders and axleboxes. One of the principal and most difficult problems associated with the use of steam at very high pressures in locomotives is that of lubricating the cylinders and piston valves; whilst for heavily loaded bearings forced lubrication has become a necessity. WAKEFIELD'S Mechanical Lubricators adequately meet both requirements.

C. C. WAKEFIELD & CO., LTD.

WAKEFIELD HOUSE, 30-32, CHEAPSIDE, LONDON, E. C. 2

RAILWAY MATERIALS

TYRES AND AXLES
LAMINATED AND COIL SPRINGS
SPIRAL AND VOLUTE SPRINGS
BUFFERS
SPRING STEELS
DAVIS STEEL WHEELS
WHEEL CENTRES
BOGIE SIDE FRAMES
LOCO DRAG BOXES
PISTON RODS
SLIDE BARS
CRANK PINS, ETC.

THOS. FIRTH & JOHN BROWN, LTD

ATLAS & NORFOLK WORKS, SHEFFIELD.

Dickson

« FRANCO »
3000 H. P.
Steam Locomotive

with 3 driving units — has hauled 1245 tons at 25 km. per hour over a 1 in 63 gradient.

LES AT
METALLUR
COMPANY LIMITED
BRUSSELS

Codes : LUGAGNE 1929
BENTLEY

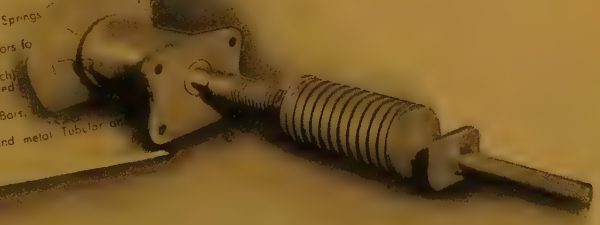
General Direction
Estimating & Drawing Offices
General Commercial Offices

Chaussée de Hal, NIVELLES (Belgium)
Teleph. 22-63-194 Nivelles Teleg. METAL-NIVELLES

WORKS AT: **NIVELLES, TUBIZE, LA SAMBRE AND MANAGE**

1° **Locomotive Department :** Steam and Electric Locomotives of all sizes for passenger and goods traffic Industrial Locomotives, Articulated Locomotives and others. Franco Locomotives.
2° **Rolling Stock Department :** Carriages " de luxe ", and of all classes for railways and tramways, welded or rivetted. Special wagons : Autobus, Trolleybus, Bogies, patent Trucks, Steel forgings forged flanges for high pressures), etc., etc
3° **Steel Construction and Bridges Department :** Fixed Bridges, Swing Bridges, Lifting Bridges, welded or rivetted, of all sizes. Strauss, Scherzer and Vierendeel Bridges and other patented types, Metal skeleton work.
4° **Hoisting and Handling Apparatus Department :** Electric Cranes, fixed and travelling, Bridge Cranes for ports, Overhead Cranes Traversers, etc.
5° **Track Appliances and Signalling Apparatus Department :** Single crossings, Double slips points, Single points, R & S. Signalling apparatus and others.
6° **Steel Foundry Department :** Manganese and other steels; Castings in one piece up to 5 tons, Axleboxes, Wheel Centres, Buffers, etc.
7° **Pressing Department :** Special pressings for Motor Car Construction, Railway Rolling Stock, Boiler and Cistern Ends, Drain Pipes, etc.
8° **Plate Work Department :** Water Towers, Gasometers, Cowpers, Steel Pipes 14" diam and up, Tanks, etc.
9° **Water Gas Lapwelding Department :** Power Pipe Lines, Hydro electric installations, Chemical industry apparatus, etc.
10 **Spring Department :** Laminated Springs, Volute and spiral Springs
Mohr, Assoi, etc., Springs for pneumatic Brakes.
11° **General Engineering Department :** Compressed Air Motors fo
Operating gears for Canal Locks, Cranes, etc.
12° **Galvanising Department :** Hot Spelter Galvanising, Zinc (rich
7 Oz per square meter, Flat, pressed corrugated, straight and curved
sorres, etc
13° **Mining Department :** Patented Ajax coal cutters, Cutter Bars,
Electric apparatus, etc
14° **Furniture Department :** Furniture of all styles in wood and metal Tubular
metal Furniture, etc.
15° **Bolt Department.**

MOHR patent system buffer of the friction type.



Company Limited

LES ATELIERS METALLURGIQUES

NIVELLES (Belgium)

NOTICE SENT ON REQUEST

ONE MAN CONTROL
ON
"SENTINEL-CAMMELL" RAIL CARS

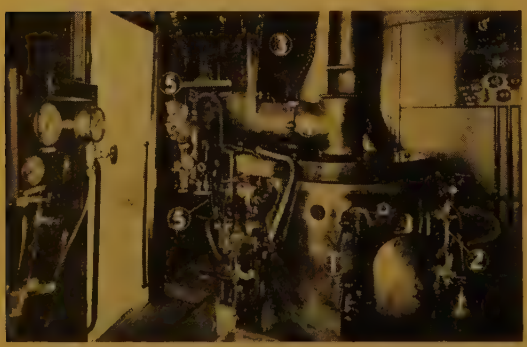
All "Sentinel-Cammell" Rail Cars whether coal or oil fired can now be equipped with automatic controls thus rendering unnecessary the presence of an attendant in the boiler compartment. The flexibility of steam, its capacity for "overload", its reliability and many other advantages are thus available with the same staff as is employed on electrically or internal combustion engine driven vehicles.

1. Water Level Gauge.
2. Electrical Water Indicator.
3. Bunker.
4. Mechanical Stoker Screw Feed.
5. Drive for Mechanica Stoker.

1. Electrical Water Level Indicator.
2. Reversing Lever.
3. Throttle Valve Handle.
4. Steam Brake — 4A. Hand Brake.
5. Sanding Lever.

"Sentinel-Cammell" 100 H.P. railbus on the Southern Railway

It should be noted that the supply of coal to the boiler through the mechanical stoker is proportioned to the amount of water evaporated. This control is exercised by means of a float chamber controlling the feed pump—at low water level the feed pump is started and continues to pump until a pre-arranged level is reached. The feed pump itself actuates the mechanical stoker and the firing continues so long as the feed pump is delivering water to the boiler—the rate of the fuel supply thus being regulated by the demand on the boiler.



FOR FURTHER PARTICULARS APPLY TO

THE "SENTINEL" WAGGON WORKS LTD.

20, IDDESLEIGH HOUSE, WESTMINSTER, LONDON, S.W.1.

IMPROVED "TORMANC MAJOR"

OIL-HARDENING STEEL

[Write for new data sheets on this Steel—just published]

WE CONFIDENTLY RECOMMEND IMPROVED "TORMANC MAJOR" FOR USE IN PLACE OF 3% and 3½% Nickel Oil-hardened Steel, or even certain NICKEL CHROME STEELS.

"Tormanc Major" is suitable for automobile crankshafts, front axles, stub axles and steering mechanism, connecting rods, wheel studs, bolts and other high tensile parts. In general engineering practice it is invaluable for high-tensile parts of medium section (for large sections use "Tormanc Special"). The steel may therefore be used to reduce the weight of carbon steel parts without loss of strength. Alternatively parts may be strengthened without increase in weight or the necessity of making new tools, dies, etc., this being obtained without serious increase in cost.

"Tormanc Major" is easily forged and machined, is particularly foolproof in treatment and is entirely free from any susceptibility to temper-brittleness.

BRITISH STANDARD SPECIFICATIONS

Of the various British Standard Specifications for steels covering ranges of tensile strength between 45 and 65 tons per sq. inch, three specifications 5005/301, 5005/302 and 2.S.2, permit the user to employ "Tormanc Major" steel whilst still being covered by British Standard Specification.

RANGE OF PROPERTIES OF OIL-HARDENED AND TEMPERED STEEL

Sections of 2½ins. Tempered about 600°C.

Max. Stress tons sq. in.	Yield Point tons sq. in.	Elong. on 2" %	Red. of Area %	Izod value ft. lbs
55 / 65	45 / 55	22 / 18	65 / 50	70 / 40

THE UNITED STEEL COMPANIES LTD

SAMUEL FOX & CO. LIMITED

Associated with The United Steel Companies Limited

STOCKSBRIDGE SHEFFIELD ENGLAND

ONE OF THE "TORMANC" SERIES OF ECONOMICAL ALLOY STEELS

Write for new data sheets to:—Publicity Department, The United Steel Companies Limited, 17, Westbourne Road, Sheffield, 10.

℗F62

Contractors to the Principal

RAILWAY & ROADWAY COMPANIES

at Home and Abroad

FOR PASSENGER VEHICLES AND GOODS TRANSPORT

Leyland

LEYLAND, LANCS.

There are Leyland Goods Vehicles for gross loads—from 2½ to 12½ tons

The Passenger Range includes four and six-cylinder chassis for Coaches, and single and double-decker Buses

LEYLAND MOTORS LTD. Head Office and Works: LEYLAND, Lancs.

DIRECT BRANCHES IN Auckland, Bombay, Brisbane, Bristol, Calcutta, Capetown, Cardiff, Christchurch, Chorley, Dunedin, Feilding, Glasgow, Hawera, Leeds, Liverpool, London, Manchester, Melbourne, Montreal, Singapore, Sydney, Toronto, Vancouver, Wellington, etc.

RAILWAY ELECTRIFICATION

INDIA

HOLLAND

The eminence of The English Electric Company in the field of Electric Traction has resulted in the adoption of their products on some of the most important Railways throughout the World. In addition to supplying Locomotives, Motor Coaches, Railway Motors and Control Equipments, The English Electric Company manufacture all the plant necessary for the Power Stations and for the equipment of Railway Substations for either entirely automatic operation or for supervisory control.

Fifty-six Railway Systems are operating «English Electric» Equipments

SOUTH AFRICA

ENGLAND

ENGLISH
ELECTRIC COMPANY LTD.
Queens House, Kingsway, London, W.C. 2.
Works: STAFFORD, BRADFORD, RUGBY, PRESTON.

BRANCH OFFICES AND ASSOCIATES ABROAD :
ARGENTINA, AUSTRALIA, BRAZIL, CANADA, CEYLON, DENMARK, EGYPT, ICELAND, INDIA, JAPAN, NEW ZEALAND, SOUTH AFRICA, MALAYA

SARO
PLYWOOD

FOR
RAILWAY AND SHIP CONSTRUCTION

The « **SARO** » plywood used by the L. N. E. R., in the construction of their new coaches was built up in large sheets, the longest being on the Buffet Car shown above. The section between the doors was in one panel.

The plywood supplied for Railway work is made to Air Ministry standards for Aircraft.

SARO CLOUD
AMPHIBIAN

Sole Agents for

SARO PLYWOOD
LAMINATED WOOD
PRODUCTS LIMITED
109 KINGSWAY, LONDON
W.C.2.

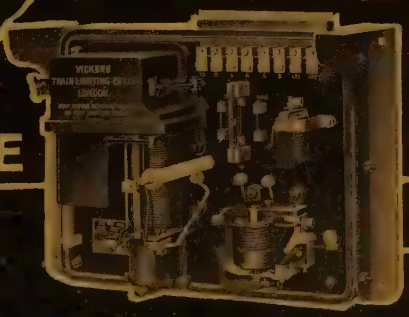
MANUFACTURED BY

SAUNDERS ROE L^D
EAST COWES I.O.W.
ENGLAND

VICKERS "V.I."

SINGLE BATTERY SYSTEM for ELECTRIC LIGHTING OF TRAINS.

THE DOES THE WORK

AND THE  CONTROLS THE LIGHT

CALL AND SEE IT IN OPERATION IN OUR SHOWROOM

VICKERS TRAIN LIGHTING Co LTD

(Proprietors: VICKERS LIMITED)

VICKERS HOUSE, BROADWAY, LONDON, S.W.1.

Telegrams: VICTRALITE, SOWEST, LONDON. Cablegrams: VICTRALITE, LONDON. Telephone: VICTORIA 6900.

John Cockerill & C°

SERAING
(Belgium)

Railway crossing of manganese steel

Mines, Iron & Steel Works
Engineering, Shipbuilding
Artillery, Cement

Concrete facts about the 5-ton ALBION

BY APPOINTMENT TO H.M. THE KING OF GREAT BRITAIN.

(GROSS LOAD CAPACITY 6-TONS.)

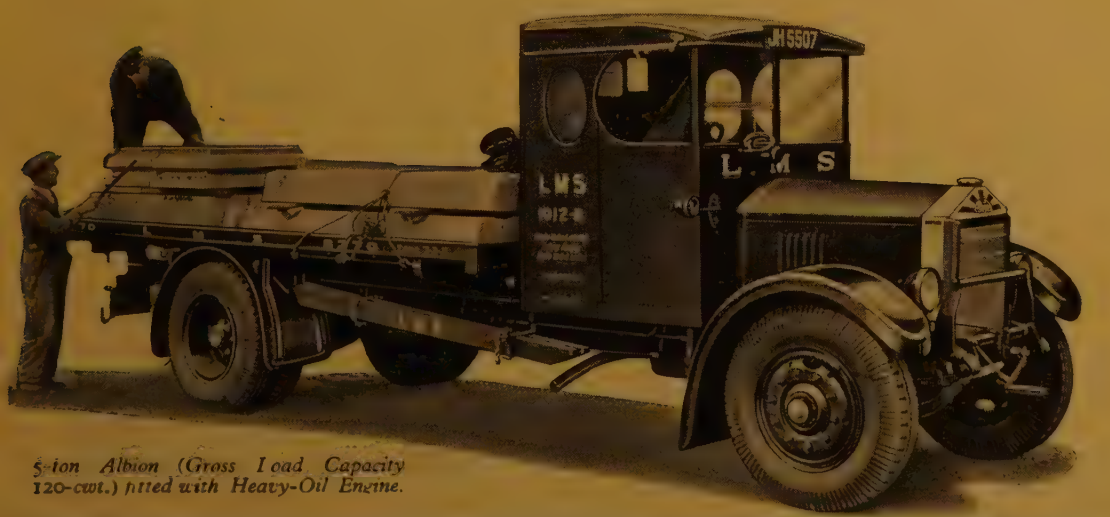
The 5-ton Albion carries its full load with unfailing reliability under all conditions. It eliminates costly breakdowns and delays. It reduces running and maintenance costs to the minimum. It is, in fact, like all Albions, an outstanding example of the completely efficient transport vehicle.

There are Albion Goods Models for gross loads from 2½ to 12 tons.

Heavy-Oil Engines can be supplied on practically all models.

Albion
SURE AS THE SUNRISE

ALBION MOTORS LTD.
SCOTSTOUN, GLASGOW, W.4.
London: - - Bank Buildings, 20 Kingsway, W.C.2.
Also at Manchester, Liverpool, Leeds, Sheffield, Nottingham, Birmingham, Bristol, Edinburgh and Belfast.



5-ton Albion (Gross Load Capacity 120-cwt.) fitted with Heavy-Oil Engine.

The G.W.R. RAILCAR

is now an established success.

Its fine performance has proved that it forms the solution to the problem of achieving speedy and economical suburban working under present day traffic conditions

AEC SOUTHALL

APPLY FOR THE RAILCAR BOOKLET WHICH WILL BE GLADLY SENT ON REQUEST

The A.E.C. 130h.p. Oil-Driven Railcar on its regular run

THE ASSOCIATED EQUIPMENT CO. LTD. SOUTHALL, MIDDX.

Cables: "Vangastow, Southall." Codes: A.B.C. 6th Edn., Bentley's & Motor Trader.

2067

'DULUX'

TRADE MARK

COACH FINISHES

for appearance, durability and ease of maintenance

Reproduced by the courtesy of A.E.C., Southall.

'DULUX' Coach Finishes are manufactured on a synthetic base, by a patented process and have been proved to possess 50% to 100% greater durability than the old-style materials. The application of 'Dulux' presents no difficulties and the beautiful finish obtained is lasting.

One 'Bus Company has reported that 'Dulux' is "fresher than paint after a year's hard wear, and even on the bonnet and round the petrol-filling cap there is no sign of deterioration or change of colour." 'Dulux' may be applied by brush or spray to any wood, metal or composition surface. No varnish coat is normally required.

Full particulars, colour card and processes may be obtained from the sole manufacturers—

NOBEL CHEMICAL FINISHES LIMITED

(Associated with Imperial Chemical Industries Limited)

SLOUGH, BUCKS

D.I 157

GRIND IT

You can produce a job with better lasting qualities, and save time and money by grinding:—

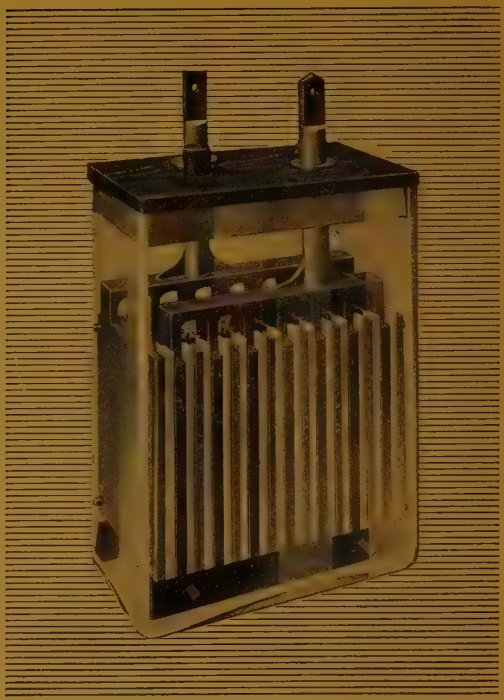
Journals, crankpins, horn cheeks, motion parts, slide bars, piston rods, superheater headers, regulator valves.

We can supply thoroughly proved Precision Grinding Machines that have been designed in co-operation with Railway Engineers for these and other classes of work in the Railway Shop.

You should have details of these machines.

Ask for a copy of "Precision Grinding in the Railway Shop".

THE CHURCHILL
Machine Tool Co. Ltd.
Broadheath, Manchester, England.
Home Selling Agents:
MESSRS. CHAS. CHURCHILL & CO., LTD.,
London and Branches
Export Sales Organisation:
ASSOC. BRITISH MACHINE TOOL MAKERS LTD.,
London and Branches



Always Reliable under any conditions

P.&G. AND E.P.S. CELLS FOR TRAIN LIGHTING

PRITCHETT & GOLD AND E.P.S. CO., LTD.
50, GROSVENOR GARDENS, LONDON, S.W.1
'Phone: Sloane 7164. 'Grams: Storage, Sowest, London
Works: Dagenham Dock, Essex

P.R.10.

NEW « TOURIST » ARTICULATED COACHES

BUILT FOR THE

LONDON & NORTH EASTERN RAILWAY

By the Metropolitan - Cammell Carriage, Wagon & Finance Co. Limited, to the designs of Mr. H. N. Gresley, C.B.E., Chief Mechanical Engineer.

METROPOLITAN-CAMMELL

CARRIAGE WAGON & FINANCE Co LIMITED

Head Office: SALTLEY, BIRMINGHAM. London Office: VICKERS HOUSE, BROADWAY, WESTMINSTER, S.W.1.

Knorr Preheater Plants

use exhaust steam of locomotives for preheating the boiler water up to 100° C, and take care of reliable and permanent boiler feeding. Considerable savings in coal can be made by the heat so regained. Greatest safety in service, minor costs in maintenance — consequently, the maximum in rentability.

Knorr's Tandem-Compound Feed Water Pumps

work independently from position of steam throttle, from temperature of tender water as well as from boiler and exhaust steam pressure. They are piston pumps for high speeds without flying wheel. Feeding the boiler can be regulated as required.
The Tolkien control (patented), simple in design, provides smooth and noiseless running. A floating damping device (patented) secures quiet feeding lines and boiler valves free of knocks.

Knorr Preheaters

embody under a well insulated jacket two exchangeable bundles of pipe which can freely extend under the influence of heat. These pipes can easily be cleaned in a short time without dismantling by Knorr's portable acid cleaning plant.
High thermical efficiency with a small heating surface!

KNORR-BREMSE
A-G BERLIN O 112

Alphabetical Index of Advertisers

Firms:		Specialities:
Albion Motor Car Co.	XVI	Commercial and public service motor vehicles.
Anglo-Franco-Belge, S. A.	—	Locomotives and Railway rolling stock.
Anti-Attrition Metal Co. (The)	XXV	Bronzes and white bronzes for railway purposes.
Armstrong Oiler Co., Ltd. (The)	XXVII	Lubricators.
Associated Equipment Co., Ltd. (The)	XVII	Passenger and commercial motor vehicles.
Ateliers de Constructions Electriques de Charleroi	XXIX	Electric train lighting. Electric signalling.
Ateliers Métallurgiques	VIII	Locomotives, Railway and Tramway Rolling Stock.
Auxiliaire des Chemins de fer et de l'Industrie	—	Preheaters, Purifiers, De-areators.
Bayliss, Jones & Bayliss, Ltd.	—	Railway fastenings, rail screws, etc.
Beardmore & Co., Ltd. (Wm.)	—	Diesel motor coaches, etc.
Bonnel (1924) Ltd. (W. A.)	—	Cemented waterproof. Sleepers, crossings, etc.
British Timken Ltd.	—	Axle boxes for rolling stock.
Broughton Copper Co., Ltd. (The)	XXX	Copper tubes, copper rods, copper plates.
Brugeoise et Nicaise & Delcuve (La)	—	Railway rolling stock and fixed equipment.
Chemin de fer Métropolitain de Paris	—	Public Transportation.
Chloride Electrical Storage Co., Ltd. (The)	—	Train lighting batteries.
Churchill Machine Tool Co., Ltd. (The).	XIX	Precision grinding machines.
Cockerill & Co. (John)	XV	Iron and steel in all forms.
Coltness Iron Co., Ltd	XXIX	Locomotive Steel Castings.
Davies & Metcalfe, Ltd.	—	Injectors, ejectors, etc.
Demag A. G.	V	Special Cranes and Lifting Appliances.
Docker Brothers	XXXI	Varnishes, Japans, Fine colours, etc.
Dunlop Rubber Co., Ltd.	XXVI	Rubber springs, Buffers, Hosepipes.
English Electric Company Ltd. (The).	XII	Railway electrification.
Firth (Thos) & Brown (John), Ltd.	VII	Hollow forgings. Tyres, axles, etc.
Frichs A/S.	—	Diesel-electric locomotives.
Gresham & Craven, Ltd.	—	Ejectors, injectors, lubricators, etc.
Guest, Keen & Nettlefolds, Ltd.	XXV	Screws.
Haine-St-Pierre (Forges, Usines et Fonderies de)	XXXI	Railway rolling stock.
Hasler, S. A.	—	Speed Indicators.
Herbert Ltd. (Alfred)	—	Makers of machine tools.
Hoffmann Mfg. Co., Ltd. (The)	XXVIII	Bearings.
Imperial Chemical Industries, Ltd.	XVIII	« Dulux » coach finishes.
Karrier Motors, Ltd.	—	Road motor vehicles.
Kearns & Co., Ltd. (H. W.)	—	Borers.
Knorr-Bremse, A. G.	XXI	Air Brakes, Feedwater Heaters, etc.
Kugelfischer	—	« Fischer » Roller Bearings.
Laminated Wood Products Ltd.	XIII	« SARO » Plywood.
Leyland Motors, Ltd.	XI	Passenger and goods motor vehicles.
Lightalloys, Ltd.	—	Aluminium alloys in all forms.
Metropolitan Cammel Carriage Wagon & Finance Co., Ltd.	XX	Welding Plant and Electrodes. Rolling stock of all kinds.
Metropolitan Vickers Electrical Co., Ltd.	—	Railway-Electrification.
Mitchell Conveyor Co. (The)	—	Conveying and handling plants, coaling plants. etc.
Pritchett & Gold and E. P. S., Ltd.	XIX	Accumulators for train lighting.
Rexine, Ltd.	XXVIII	Leathercloths.

Firms:		Specialities:
Roberts Ltd. (J. W.)	XXIII	Asbestos products in all forms.
« Sentinel » Waggon Works, Ltd. (The).	IX	Locomotives, Rail cars, etc.
Spencer-Moulton & Co., Ltd. (George).	XXXII	India rubber springs of all kinds.
Still & Sons, Ltd. (W. M.)	—	Kitchen and service equipment.
J. Stone & Co., Ltd.	—	Railway specialities of all kinds.
Superheater Company (The) London . .	—	Superheaters for locomotives and multiple valve regulator headers.
Superheater Company (The) New York.	XXIV	Steam superheaters for locomotives, marine, etc.
Taylor Bros & Co., Ltd.	—	Wheels and Axles.
United Steel Companies Ltd. (The) . .	X	Steel sleepers, steel for all purposes.
Usines Emile Henricot (S. A.)	—	Steel and iron founders.
Vacuum Brake Co., Ltd.	XXVI	Air Brakes.
Vacuum Oil Company Ltd.	—	Lubricants for locomotives.
Vereinigte Eisenbahn-Signalwerke . . .	IV	Railway signalling.
Vereinigte Westdeutsche Waggonfabriken.	—	Rolling stock.
Vickers Train Lighting Co., Ltd. . . .	XIV	Train lighting dynamos and equipment.
Vi-Spring Products, Ltd.	XXX	Seat springs.
Wakefield & Co., Ltd.	VI	Mechanical lubricators: oils for all purposes.
Westinghouse Brake & Saxby Signal Co., Ltd. (The)	I-II-III	Railway signalling. Brakes. Heating systems.
Wild & Co. (A. G.)	—	Railway supplies, steam heating, etc.
Willford and Company, Ltd.	XXVII	Railway springs and for all their purposes.

J. W. ROBERTS LTD

SPECIALISTS IN THE MANUFACTURE & APPLICATION OF

HEAT INSULATION
for LOCOMOTIVES, CARRIAGES
TANK WAGONS, REFRIGERATOR VANS
RAIL CARS AND ROAD VEHICLES, ETC.

FIREPROOF PANELLING
FLOORING, PARTITIONS,
DECORATIVE PANELLING

ETC.

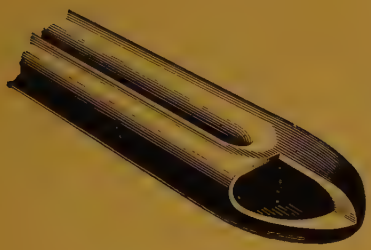
NOISE REDUCTION

MIDLAND WORKS
ARMLEY, LEEDS 12

LONDON, 1 BROAD
STREET PLACE, E.C.1

FIRETUBE SUPERHEATERS

Integrally Forged Return Bends

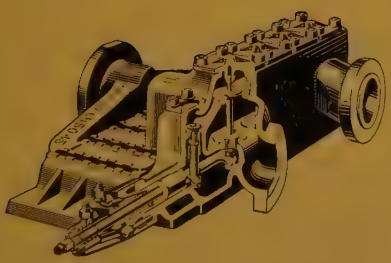


Long experience has demonstrated conclusively the superiority of the design and construction of Elesco (Schmidt) superheaters, and their reliability and efficiency in operation. This is due largely to exclusive use of return bends, integrally forged with the tubing which form the loops of the superheater elements or units. These bends are machine-forged without utilizing either additional material or a flux.

Units so formed are homogeneous and as strong as the original tubing. At the bends, increased thickness of the metal gives additional strength at the point where it is needed most. This method of construction also gives constant internal area, with smooth surfaces within the return bends which offer no restriction to the flow of steam. The smooth exterior surfaces avoid collection of soot, ashes or cinders.

Millions of these return bends are in use daily in the severest service on steam railroads throughout the world, where Elesco superheaters are now standard.

Headers



Headers for Elesco superheaters are made of the very best gray iron and are designed to meet internal stresses to which they are subjected through constant vibration and variations in temperature.

A recent development of the finger type header has the multiple-valve throttle or regulator integral with the casting, as illustrated. Without complicating the smokebox arrangement, this throttle or regulator offers many advantages over other designs. the steam is controlled between the superheater and the cylinders, and by the consecutive opening and closing of a series of small valves the steam supply to the cylinders is finely graduated. Steam at full boiler pressure constantly circulates through the units, protecting them from overheating. The multiple-valve throttle-header is being adopted rapidly for every class of locomotive service.

THE SUPERHEATER COMPANY

60 East 42nd Street, New York, N. Y., U. S. A.

ASSOCIATED COMPANIES:

The Superheater Company, Limited
Dominion Square Bldg., Montreal, CANADA

Compagnie des Surchauffeurs
Rue la Boëtie 3, Paris, FRANCE

ELESCO

The Superheater Company Limited
Bush House, Aldwych, London, W.C. 2, ENGLAND

Schmidt'sche Heissdampf-Gesellschaft, m. b. H.,
Rolandstrasse 2, Cassel-Wilhelmshöhe, GERMANY

The Superheater Company (Australia) Limited
Manchester Unity Building, 185 Elizabeth Street, Sydney, N. S. W.

Agencies Throughout the World

NETTLEFOLDS SCREWS

Standard quality all over the world

TRADE MARK

GUEST, KEEN & NETTLEFOLDS, LIMITED,
BIRMINGHAM -- ENGLAND

ANTI-ATTRITION

BRONZES AND WHITE BRONZES

ANTI-ATTRITION BRONZES ARE THE MOST EFFICIENT FOR LOCOMOTIVE AXLE BOXES, BEARINGS, BUSHES, SLIDE VALVES, AND ALL NON-FERROUS WEARING PARTS.

ANTI-ATTRITION WHITE BRONZES FOR LINING UP LOCOMOTIVE BEARINGS, CONNECTING ROD AND COUPLING ROD BUSHES, ECCENTRIC STRAP LINERS,

CARRIAGE AND WAGON BEARINGS, ETC.
SUPPLIED IN INGOTS, CASTINGS, OR ACCURATELY FINISHED TO SAMPLES OR DRAWINGS.

CONTRACTORS TO THE ADMIRALTY, WAR OFFICE, DOMINION GOVERNMENTS BRITISH AND FOREIGN RAILWAYS, LONDON COUNTY COUNCIL AND OTHER CORPORATION TRAMWAYS, STEAMSHIP COMPANIES, MOTOR TRANSPORT COMPANIES AND ENGINEERS.
SOLE MANUFACTURERS

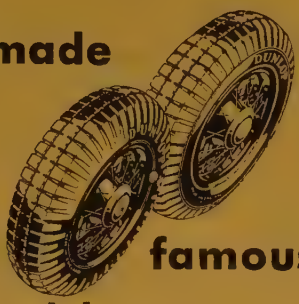
LONDON OFFICE
1, VICTORIA ST., S. W. 1.

THE ANTI-ATTRITION METAL COMPANY, LTD.

Glengall Works, Glengall Rd.
London, S. E., 15

The SERVICE and SATISFACTION

which have made



famous

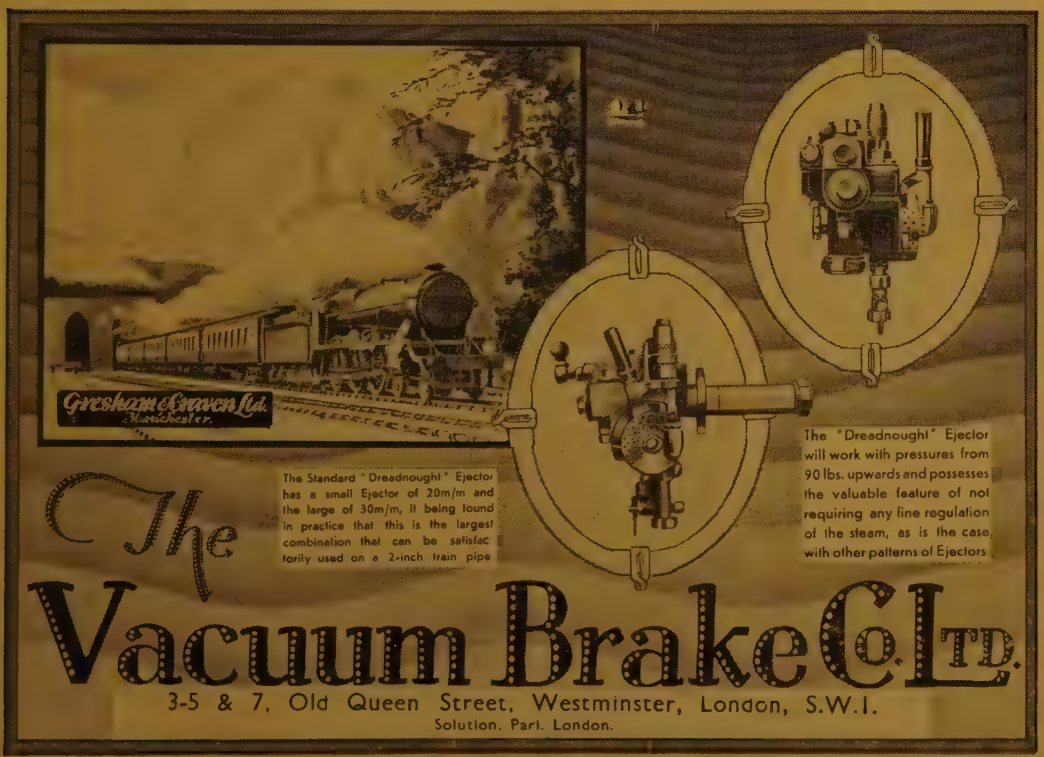
are experienced by users of

DUNLOP
RAILWAY RUBBER
SPRINGS, BUFFERS & HOSE PIPES

Whrite for full details of the Dunlop Railway Service to :—

DUNLOP RUBBER CO., LTD.,
(General Rubber Goods Division) Cambridge Street, MANCHESTER

4MRR2/1 C.F.H


Gresham & Craven Ltd.
Manchester.
The Standard "Dreadnought" Ejector has a small Ejector of 20m/m and the large of 30m/m, it being found in practice that this is the largest combination that can be satisfactorily used on a 2-inch train pipe
The "Dreadnought" Ejector will work with pressures from 90 lbs. upwards and possesses the valuable feature of not requiring any fine regulation of the steam, as is the case with other patterns of Ejectors
The
Vacuum Brake Co. LTD.
3-5 & 7, Old Queen Street, Westminster, London, S.W.1.
Solution. Parl. London.

Telegraphic Address :
OILER, YORK.

THE

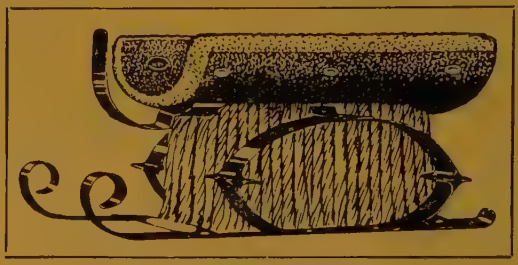
Codes used : ABC 5th Edition.
Telephone : 2946

ARMSTRONG OILER C° Ltd.

YORK

Patentees and Manufacturers of
The "ARMSTRONG" Oiler.

For lubricating
All Types of
Railway and
Tramway
Journals.



Efficient
and
Perfect in
Every Detail.

" ARMSTRONG OILER "
as supplied for Railway Tender Axle-Boxes.

SAMPLE SETS FOR TRIAL SUPPLIED FREE OF CHARGE.

SPRINGS

WILLFORD & COMPANY LIMITED,
ESTABLISHED 1890

LONDON OFFICE :
34, Victoria Street,
Westminster, S.W 1.

PARK HOUSE WORKS, SHEFFIELD.
Telephone: 21114 SHEFFIELD.
Telegrams: "AUDAX, 'PHONE, SHEFFIELD."
Code: BENTLEYS.

ALSO AT
BURNBANK WORKS.
DENNISTOUN. GLASGOW.

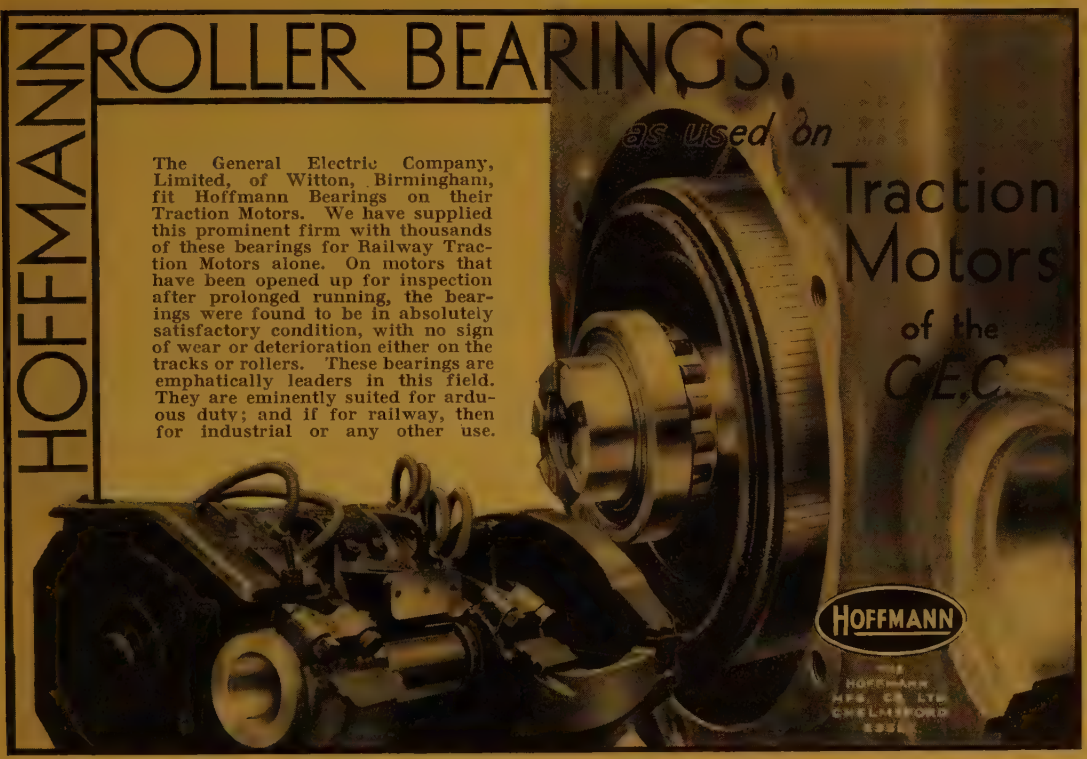
CONTRACTORS TO THE LEADING BRITISH, INDIAN, SOUTH AMERICAN AND COLONIAL RAILWAYS.
MODERN PLANT, SERVICES OF FIRST CLASS DESIGNING STAFF AVAILABLE.

HOFFMANN ROLLER BEARINGS

as used on

Traction Motors of the G.E.C.

The General Electric Company, Limited, of Witton, Birmingham, fit Hoffmann Bearings on their Traction Motors. We have supplied this prominent firm with thousands of these bearings for Railway Traction Motors alone. On motors that have been opened up for inspection after prolonged running, the bearings were found to be in absolutely satisfactory condition, with no sign of wear or deterioration either on the tracks or rollers. These bearings are emphatically leaders in this field. They are eminently suited for arduous duty; and if for railway, then for industrial or any other use.



PANELLING AND LINING CLOTHS ARE USED ON THE

NIGHT SCOT

FOR SLEEPING BERTHS AND STANDARD THIRD CLASS COMPARTMENTS

Full particulars of "Rexine" panelling on application to:

I.C.I. (REXINE) LTD., HYDE, CHESHIRE

I.C.I. (Rexine) Ltd. is a subsidiary company of Imperial Chemical Industries Limited

London Office: 60 Wilson St., Finsbury, E.C.2

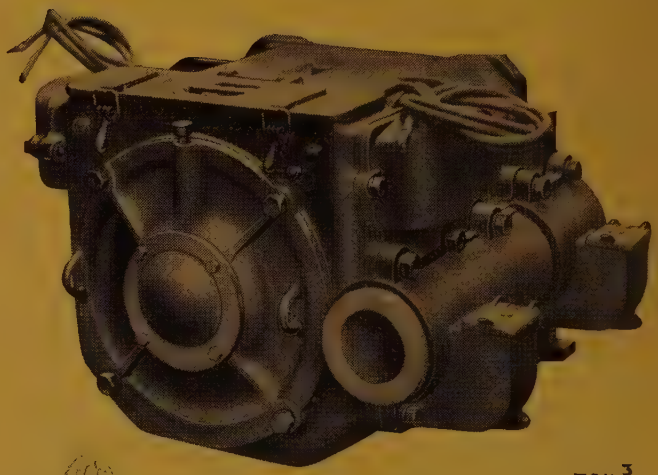
R.A.376

A.C.E.C.

Ateliers de Constructions Electriques de Charleroi

Electric traction plant
Motors and equipment
Electric lighting plant
for trains

Electric signalling
Wires and Cables



7011 3

Coltness Iron Company Limited

NEWMAINS, LANARKSHIRE, SCOTLAND

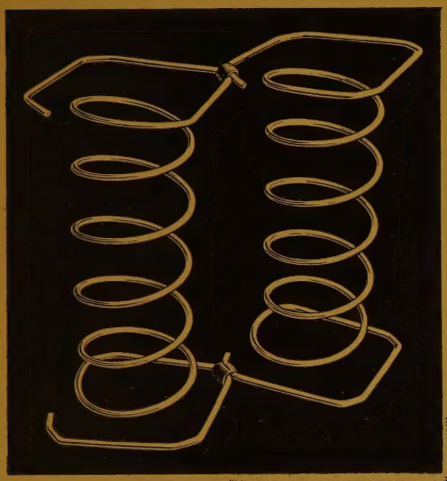
We specialize in
Locomotive Steel Castings

Wheel Centres, Domes, Piston Heads, Horn Blocks, Axleboxes, etc.
of which we are the largest makers in Great Britain
Steel castings up to 15 tons - Iron Castings up to 50 tons

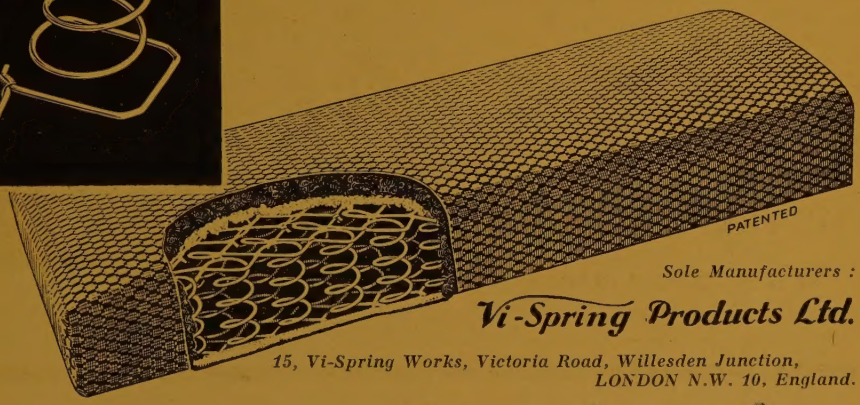
London Office : 10 Iddesleigh House, Caxton Street, London S. W. 1.
Indian Office : Turner Hoare & Co., Gateway Bldg. Appollo Bunder, Bombay
South African Office : D. Drury & Co. Ltd., P. O. Box 3929, Johannesburg

THE MOST EFFICIENT SPRING-SEATING MADE

THE 'Vito' SPRING



The unique shape of the patent Vito Springs permits a method of assemblage which is the most efficient ever used in upholstery. The end coils of every « VITO » Spring are of square outline, allowing the corner portions of the end convolutions to be clipped to the adjacent springs. The end coils being incomplete, permit expansion to relieve the rigidity so pronounced in all other systems of clipped spring-seating, and give « VITO » seating an unequalled resiliency and durability.

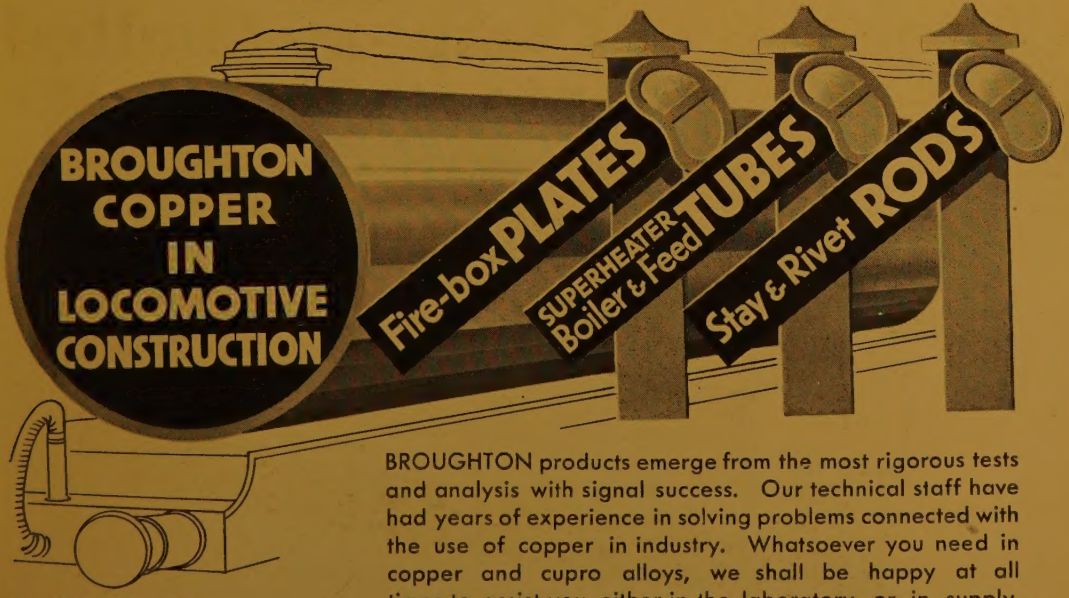


Write for particulars and trade terms.

Sole Manufacturers :

Vi-Spring Products Ltd.

15, Vi-Spring Works, Victoria Road, Willesden Junction, LONDON N.W. 10, England.



BROUGHTON products emerge from the most rigorous tests and analysis with signal success. Our technical staff have had years of experience in solving problems connected with the use of copper in industry. Whatsoever you need in copper and cupro alloys, we shall be happy at all times to assist you, either in the laboratory, or in supply.

" STAY-TITE " Copper
(SILVER - ARSENICAL)
for Stay-rods, Plates and Rivets. Does not permanently deform under compressive stress, and so avoids leakage and prevents wastage at Stay-heads.

BROUGHTON COPPER COMPANY LTD.
MANCHESTER, ENGLAND

D O C K E R S'

PAINTS & VARNISHES

FOR ROLLING STOCK

ALSO

SYNTHOLUX the New air-drying Synthetic Paint of extraordinary character and durability. Suitable for brush or spray application.

THERMOLUX low temperature Stoving Enamel is the latest industrial finish. It is appl ed by spray and the finish is very hard, lustrous and has great durability.

INDUROLEUM the modern floor covering for coaches and buildings; fireproof and hygienic.

OUR UNRIVALLED EXPERIENCE IS FREELY AT YOUR DISPOSAL.

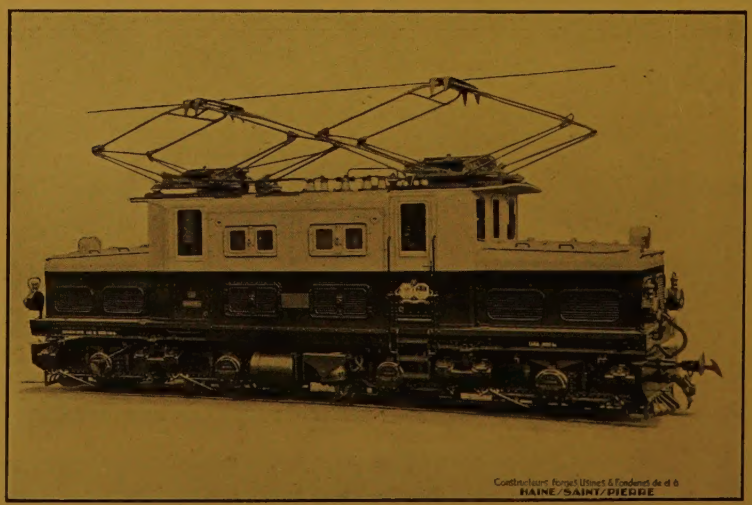
DOCKER BROTHERS

HEAD OFFICE & WORKS. ROTTON PARK STREET, **BIRMINGHAM 16.**
Telephone : EDGBASTON 3001. Telegrams " JAPAN, BIRMINGHAM "
LONDON DEPOT : 4-6, MOOR LANE, LONDON. E. C. 2
Telephone : METROPOLITAN 2775. Telegrams " MATURED BARB, LONDON "

FORGES, USINES & FONDERIES
DE ET A

HAINE - SAINT - PIERRE

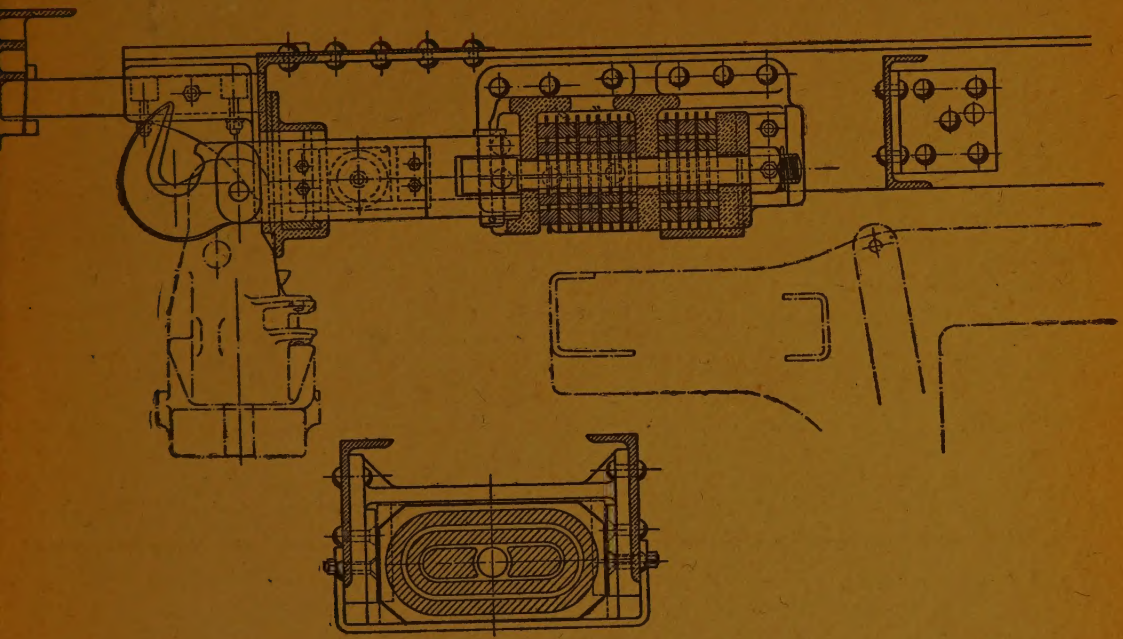
BELGIQUE



ALL KINDS OF RAILWAY TRACTION EQUIPMENT AND ROLLING STOCK
TELEGRAPHIC ADDRESS : GOLDSCHMID - HAINE-ST-PIERRE - BELGIUM

L.N.E.R. TOURIST TRAINS

NDARD ARRANGEMENT OF BUCKEYE BUFFER & DRAWGEAR FOR STEEL
DERFRAMES FITTED WITH SPENCER MOULTON SPRINGS



CROSS SECTION

itted with

SPENCER MOULTON RUBBER SPRINGS

GEO. SPENCER MOULTON & CO. LTD., 2, CENTRAL BUILDINGS, LONDON, S.W.1

S. A.
M. WEISSENBRUCH
BRUXELLES